COMMODORE USERS

Ahoy!

SECOND ANNIVERSARY SPECIAL
More Editorial Pages than Ever Before!

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Ahoy!

DEPARTMENTS

FEATURES

*Includes programs: *RS-232 Receiver, ASCII Transmitter, Sequential Transmitter, Sequential Receiver* (for the VIC and 64)
**Includes programs: *Talking Clock* and *Ahoy! Babbler* (for the VIC 20 and C-64)
***Includes program: *Sketcher* (for the C-64)

PROGRAMS

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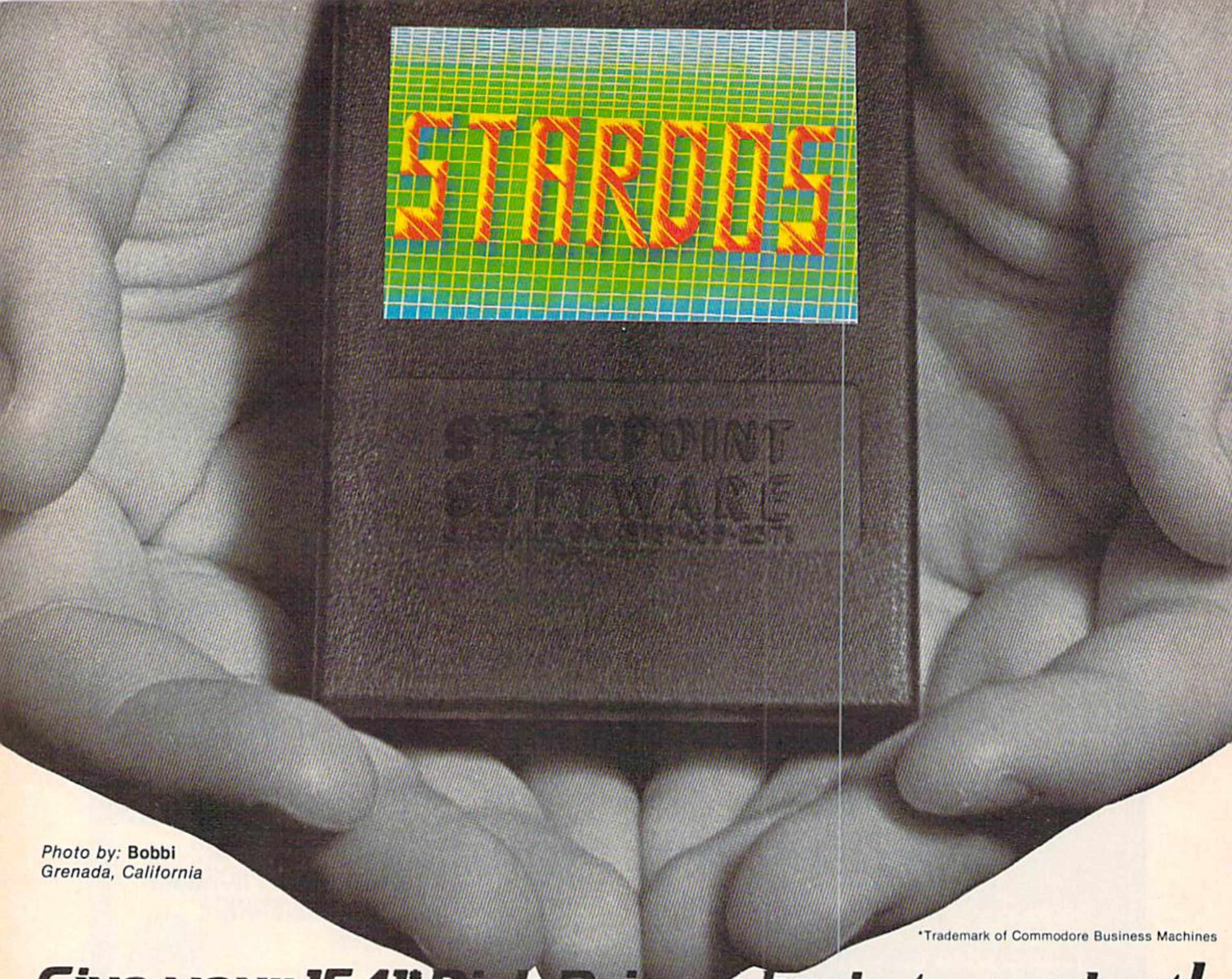


Photo by: **Bobbi**
Grenada, California

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Reader Service No. 281

VIEW FROM THE BRIDGE

What could we do, we wondered, to commemorate our second anniversary? We do our best to delight the serious Commodore user every month of the year anyway—and you can't do better than your best! But, we finally reasoned, we can do more of it! And so, though this issue includes significantly less advertising than our last few, we've maintained the same 148 page count (144 if you're picky and don't count covers). That means more editorial pages—including (depending, again, on how you count) 13 complete programs!

As for feature articles, we've our usual abundance of them as well—with the exception of *Creating Your Own Games on the Commodore 64.* Was Orson Scott Card simply unable to meet this month's deadline after three straight weeks of 16-hour days programming last month's *Gypsy Starship*—or did a band of roving gypsies take exception to his depiction of their race? You'll have to see if his column returns next month to find out.

• Morton Kevelson's survey of *Speech Synthesizers for the Commodore Computers* concludes this month with a look at (or is that a listen to?) *VIC-Talker, Hearsay 64,* and *LIS'NER 1000.* (Turn to page 32.) Coincidentally, while Morton prepared his two-part review, the perfect companion piece walked in our door—a speech synthesizer construction project. Morton worked with creator Isacc Michalowski to bring the *Ahoy! Babbler/Talking Clock* to fruition. (Turn to page 38.)

• This month's *Rupert Report* continues to explore *The Magical Link* through which computers can talk to each other—the RS232 serial port. By the time Dale Rupert is done, the C-64's in your room may keep you awake nights with their gabbing. (Turn to page 20.)

• As our cover announces, *Streamer Font* is a banner program. Literally! Bob Spirko's latest lets you generate *Print Shop*-like banners of unlimited length. (Turn to page 28.)

• In addition to surveying the field of team sports simulations for the 64 in this month's *Entertainment Software Section*, Arnie Katz and company provide full-length reviews of *Karate Champ, Alice in Videoland, Star Rank Boxing, Hacker,* and *The Island Caper.* (Turn to page 47.)

• *Microsim* lacks the cockpit window view of full-blown flight simulators, but includes a respectably complete instrument panel. (Turn to page 89.)

• Remember *Alice in Adventureland,* published last January? So do strategy game lovers around the country, who've clamored ever since for another game of like quality! Problem is, we didn't have one...until Derrick Brundage wrote *The Haunted Castle*, featured in this issue. (Turn to page 60.) And because the average arcade action game would look sick sharing an issue with Derrick's sparkler, we've included *The Martian Monsters.* (Turn to page 72.) Finally, to insure that the games in this issue knock you out, we've included—*Knockout!*

• This month's programming utilities are too numerous to describe, but their names should be enough to get you typing: *BASIC Relocator, Scratch Pad, Alarm Clock, Memory Check,* and *Infraraid.* The documentation for the last-named program is in itself a complete article on identifying and trapping bugs in your programs.

Nor do we have room to describe what Mark Andrews and Cheryl Peterson have in store for you this month (in *Commodore Roots* and *Cadet's Column,* respectively). Or about the many products featured in this issue's *Reviews* section. But we're sure you can find your way.

If you haven't yet subscribed to *Ahoy!,* perhaps the offer in this issue will provide you with the needed incentive. For no more than the price of a year's subscription, you can now receive 12 issues of *Ahoy!* and a free PlayNET membership kit—A $19.95 value! Some conditions apply. See page 81 for details.

See the rest of this issue of *Ahoy!* for the best in Commodore home computing. Happy anniversary!

—David Allikas

SCUTTLEBUTT

HAM RADIO PROGRAM • GAME DESIGN CONTEST • PORTFOLIO MANAGER • ROBOTICS PROGRAMMING • GAMES FROM MINDSCAPE, SSI • NLQ FOR MICROLINE 182 • HALLEY'S COMET TRACKER • FOREIGN LANGUAGE SOFTWARE • CBS PRICE REDUCTIONS • PRINTER STANDS • C-128 BOOKS

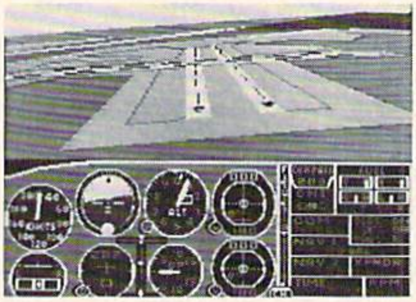
DISK CAMERA

Similar to *Isepic* (see review in October '85 *Ahoy!*), *Snapshot 64* backs up software by making a copy of your computer's memory and saving it to disk with an autoboot so it can be easily loaded back in. *Snapshot*'s manufacturers claim, however, that it will make backups in about one-third the time of *Isepic,* without the need to determine parameters. Files created will work with the Epyx *Fast Load* cartridge, and MSD and 4040 disk drives. Additionally, they will work without the *Snapshot* cartridge being present. Price is $49.95 plus $3.50 shipping.

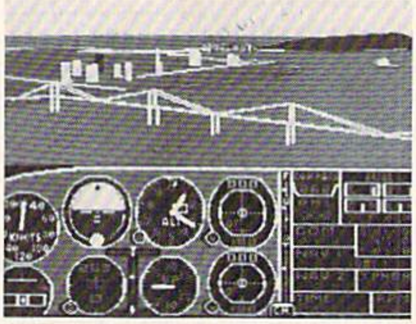
CSM Software, Inc., P.O. Box 563, Crown Point, IN 46307 (phone: 219-663-4335).

GAME RELEASES

The first person to solve the mystery of *The Dolphin's Rune,* newly translated to the C-64 by Mindscape, will receive a one-week, expense-paid trip for two to Hawaii or the Turks and Caicos Islands in the West Indies. The game requires the player-dolphin to survive sharks and fishing nets and learn to swim through the game's "color currents." As his skills improve, the ocean fills with dolphin sounds that can lead him to seabeds containing fragments of an epic poem composed in a runic alphabet. Nine successive trips yield nine stanzas, which must be deciphered to reveal clues to a secret location somewhere on earth. This location provides a tenth stanza and the name of the location. The winning entrant will submit the nine deciphered stanzas, plus the tenth stanza and the name of the secret location. More detailed rules are packaged with the program, which is priced at $29.95.



One of 6 SubLOGIC scenery disks.
READER SERVICE NO. 269



Disks cover entire western half of continental US, with detailed views.

Also new from Mindscape are the following American releases of three graphic adventures for the C-64, priced at $29.95 each:

Quake Minus One gives you 10 hours to destroy four members of the Robot Liberation Front who have sabotaged an undersea power station. Fail, and the renegade robots will trigger an earthquake that will paralyze the Western world.

Shadowfire beams six superhero types aboard an alien spacecraft to rescue a kidnapped ambassador. A Game Changer disk available by mail for $9.95 allows players to change scenarios.

Lords of Midnight, an adventure without text entry, requires players to traverse the Land of Midnight in search of Doomark the Witchking. More than 32,000 different landscapes can appear during the course of play.

Mindscape Inc., 3444 Dundee Road, Northbrook, IL 60062 (phone: 312-480-7667).

Six different scenery disks have been released by SubLOGIC, expanding the potential flying environment of flight simulation products like *Flight Simulator II* and *Jet.* The disks cover the entire western half of the continental U.S., each including the major airports, radio-nav aids, cities, highways, rivers, and lakes located in a particular region. Sufficient detail is included on each disk for either visual or instrument cross-country navigation. Price is $19.95 each or all six for $99.95.

SubLOGIC Corporation, 713 Edgebrook Drive, Champaign, IL 61820 (phone: 217-359-8482; for orders 800-637-4983 except IL, AK, HI).

How *do* they do it? In an age of supposedly depressed software sales, SSI continues to release new war simulations at an astonishing clip. Their only worry is that they'll run out of battles to recreate. New this month for the C-64:

Battle of Antietam ($49.95) simulates the 1862 skirmish along the Antietam Creek at Sharpsburg, PA. The one- or two-player game can be played at introductory, intermediate, or advanced levels.

Norway 1985 ($34.95), the fourth

SHADOW

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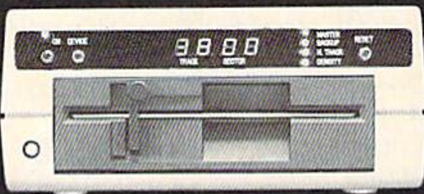
Shadow is a new and revolutionary way to back up your most protected software. It encompasses all the latest advances in software, as well as a highly sophisticated piece of hardware. This is absolutely **the best** utility available today. You may not even need updates, but if you do, the Shadow's unique design allows for updates to be available for a nominal fee. INTRODUCTORY OFFER **$89.95**

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- Track, sector, ID, check sum, drive status
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- Density use on each track
- Half tracks that are used
- Command recorder shows exact commands that were sent to the 1541 while program was loading
- RAM recorder records custom DOS

Shadow-scan any disk, then read exact list of:

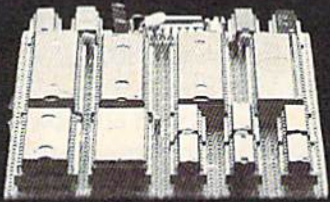


- Valid tracks, half tracks, partial tracks and segments
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Exclusive snap shot recorder will give you an exact copy of the 1541 RAM and can be viewed, saved or printed. Plus many more features included.

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Order by phone 24 hrs./7 days or send cashier's check/money order payable to Megasoft. Visa, MasterCard include card # and exp. date. Add $3.50 shipping/handling for continental U.S., $5.50 for UPS air. CODs add $7.50, Canada add $10.00. Other foreign orders add $15.00 and remit certified U.S. funds only. Distributors invited and supported.

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Reader Service No. 268

entry in the "When Superpowers Collide" series, deals with the Soviet occupation of Norway and NATO's counterattack. Infantry and mortar infantry ski troops are used in addition to the regular fighting units. For one or two expert-level players.

U.S.A.A.F. ($59.95) simulates the US Air Force daylight bombing of German industry from 1943-1945. The advanced game for one or two players utilizes 20 types of fighters and 4 types of bombers.

Strategic Simulations Inc., 883 Stierlin Road, Bldg. A-200, Mountain View, CA 94043-1983 (phone: 415-964-1353).

Activision adventure games *Hacker* (see review this issue) and *Mindshadow* will be released in versions tailored for the Amiga. And due from Activision for the 64: a game adaptation of *The Rocky Horror Show.*

Activision, Inc., 2350 Bayshore Frontage Road, Mountain View, CA 94043 (phone: 415-960-0410).

Spinnaker's UXB subsidiary will distribute British best seller *Kung Fu: The Way of the Exploding Fist* on this side of the Atlantic. The C-64 game for one or two players includes over 15 different karate moves, Oriental background music, and realistic sound effects. Price is $29.95.

UXB, division of Spinnaker Software Corp., 1 Kendall Square, Cambridge, MA 02139 (phone: 617-494-1200).

The new Artworx Program Exchange, or PX, line of software consists of 11 programs for the C-64, ranging from arcade games to mystery thrillers to family adventures. Price is $9.95 each.

Artworx Software Company, Inc., 150 North Main Street, Fairport, NY 14450 (phone: 800-828-6573 or 716-425-2833).

A simulation of a robotics manufacturing business over 72 operating months, *American Dream* ($119.95) puts you in the pinstripes of the CEO, with the goal of increasing market share and profitability. Seven department heads report to you on sales, manufacturing, engineering, production, R&D, materials management, quality assurance, and finance. General industry trend data is also made available in graphic form. Your decisions will be affected by GNP, inflation, interest rates, competitors' prices, industry demand, labor rates, materials prices, and lead times.

Blue Chip Software, 6740 Eton Avenue, Canoga Park, CA 91303 (phone: 818-346-0730).

BOOK RELEASES

If you find 30 days too long to wait between installments of *Commodore Roots,* you can now learn assembly language from Mark Andrews at your own rate. *Commodore 64/128 Assembly Language* ($14.95), just released by Howard W. Sams & Co., is targeted for the reader with high interest but little experience in using the 6502's native tongue. In addition to beginner-level concepts, the volume provides a collection of assembly routines, plus intermediate material covering sprites and other graphics. Followers of *Commodore Roots* will find much of the book's content familiar: designing a character set, writing joystick-controlled action games, drawing hi-res graphics, intermixing BASIC with machine code, and more.





Ahoy! ***columnist Mark Andrews authored one of Howard W. Sams' two new books on the C-128, covering assembly programming. READER SERVICE NO. 270***

Something of a computer industry guru himself after publishing 13 books, Mark has spent much of the past two years researching his next volume—about gurus. So if you see a mantra-generating routine in a future edition of *Roots,* you'll understand why.

Also new from Sams is *The Official Book for the Commodore 128 Personal Computer* ($12.95), which explains how to access hundreds of CP/M business programs, how to use the 128 as a 64 with existing software and peripherals, and the machine's enhanced abilities.

Howard W. Sams & Co., Inc., 4300 W. 62nd Street, Indianapolis, IN 46268 (phone: 317-298-5400).

An updated version of *Assembly Language for Kids* (see review in April '85 *Ahoy!*), with all the book's programs reconfigured for programming in C-128 mode using the machine's built-in assembler, has been released by Microcomscribe. Also included are a C-128 memory map, new BASIC 7.0 tokens, C-128 sprite assembler with new addresses for sprite storage, information on switching memory banks, and instructions on using the monitor and mini-assembler. Despite the 29 additional pages, the book's price remains $14.95.

Microcomscribe, 8982 Stimon Ct., San Diego, CA 92129 (phone: 619-484-3884 or 578-4588).

Available in a new edition with over 200 additional pages and much of its previous content updated, *The Complete Handbook of Personal Computer Communications* ($14.95) tells users what to look for in a modem and communications program, how to utilize electronic mail and teleconferencing, what to consider when evaluating electronic banking systems, how to sell stocks, commodities, and securities online, and more.

St. Martin's Press, 175 Fifth Avenue, New York, NY 10010 (phone: 212-674-5151).

WEST COAST SHOW

The Commodore Show II, a trade exhibition featuring the latest hard-

ware and software for Commodore machines from the C-64 to the Amiga, will be held on Saturday, February 8 and Sunday, February 9 from 10 a.m. to 6 p.m. at the Cathedral Hill Hotel in San Francisco. Experts will speak on graphics, telecommunications, business applications, and other subjects. Last year's show drew 5200 attendees, many of whom stopped in at the *Ahoy!* booth. If you attend this year, we hope you'll do likewise.

For information on booth space or advance ticket sales, contact the West Coast Commodore Association, P.O. Box 210638, San Francisco, CA 94121 (phone: 415-982-1040).

MICROLINE NLQ

It's taken them only a couple of years longer than the rest of us, but printer manufacturers have finally realized that near letter quality printing is a highly desirable feature in a dot matrix printer. In next issue's *Reviews* section you'll read about a hardware enhancement for making the near letter quality printing of the Star SG-10/15 even nearer. And now a $24.95 PROM kit available from Okidata will endow the Microline 182 printer with near letter quality printing capability. Included is a PROM chip, installation instructions, and user's manual addendum.

Also new from Okidata is the $229 Cut Sheet Feeder 900 for the Microline 192 and wide-carriage 193 printers, capable of accepting up to 170 sheets through the input hopper.

Okidata, 532 Fellowship Road, Mt. Laurel, NJ 08054 (phone: 609-235-2600).

EDUCATIONAL PROGRAMS

Two for the 64 from Sunburst Communications:

Trading Post ($59.00) encourages elementary and junior high school students to think ahead as they barter general store items with the object of matching the selection randomly chosen by the computer. Advanced levels require students to match up to eight objects, with increasingly complex trading rules.

Hide 'N Sequence ($69.00) challenges students to reconstruct scrambled literary passages that demonstrate four types of writing (narration, exposition, description, and persuasion) and then use what they've learned about organization and sequence to create their own stories.



Grover's Adventures: *name animals.*
READER SERVICE NO. 271



Pals Around Town: *create stories.*
READER SERVICE NO. 272

Sunburst Communications, 39 Washington Ave., Pleasantville, NY 10570 (phone: 800-431-1934 or 914-769-5030).

Two new C-64 releases from DLM:

Create with GARFIELD! ($29.95) lets cat lovers design and print their own cartoons by choosing characters, setting scenes with backgrounds and props, and combining prewritten captions or creating their own. The software includes suggestions for creating name tags, place cards, invitations, notices, and signs.

The Writing Adventure ($59.95) lets students write, edit, and print their own stories. Included are color graphics, suggested storylines, and prompting questions that aid in developing ideas.

DLM Inc., One DLM Park, Allen, TX 75002 (phone: 214-248-6300).

Why squint into a telescope on some freezing rooftop? *CometWatch* provides three programs for calculating and plotting the orbit of Halley's comet onscreen. The C-64 astronomer can also calculate the comet's position in the sky for any date, time, lattitude, and longitude during its 1985/86 return. Also included is information on the physics of comets and how to observe and photograph them.

Zephyr Services, 306 S. Homewood Ave., Pittsburgh, PA 15208.

Three C-64 releases from Free Spirit Software, Inc.:

Technique! ($12.95) instructs the user in graphics, animation, sound, and music programming. A machine language music program, 12 songs, and an arcade game are included.

BASICally Simple ($20.00) explains C-64 BASIC commands and operators in simple terms. Once the user has mastered BASIC, the disk serves as a reference guide.

Italy ($15.00) teaches common Italian phrases through a text game.

Free Spirit Software, Inc., 5836 S. Mozart, Chicago, IL 60629 (phone: 312-476-3640).



Direct Ernie's Rubber Duckie to him.
READER SERVICE NO. 273

CBS Software has trimmed its product line to 45 titles and cut prices on the following C-64 programs:

Reduced to $14.95: *Astro-Grover, Sesame Street Letter-Go-Round, Big Bird's Funhouse, Mister Rogers' Many Ways to Say I Love You, Dr. Seuss Fix-up the Mix-up Puzzler, Webster: The Word Game.*

Reduced to $19.95: *Richard Scarry's Best Electronic Word Book Ever!.*

Reduced to $24.95:Murder by the Dozen, Felony!, Adventure Master.

Released at $14.95 each are the following C-64 games developed by the Children's Television Workshop for tykes aged four to six:

Sesame Street Pals Around Town introduces children to the physical and social characteristics comprising a community as they explore a classroom, a schoolyard, a downtown street, Bert and Ernie's apartment, and Sesame Street. In each location, children create their own scenes and stories with music and graphics.

Grover's Animal Adventures teaches children to identify animals, presented by the program in four environments: the African grasslands, the Atlantic Ocean, a North American forest, and a barnyard. Children learn to associate animals and objects with their printed names and create their own nature scenes.

Ernie's Big Splash requires children to help a bathing Ernie procure his Rubber Duckie by building a pathway from soap dish to tub. An open fire hydrant, a water slide, and a friendly alligator are among the building pieces used in directing Duckie.

CBS Software, One Fawcett Place, Greenwich, CT 06836 (phone: 203-622-2500).

Smoky Mountain Software informs us that a number of bugs have been discovered in their *Grade Manager III* program. Owners desiring the correct version should return their disks, enclosing $2.00 per disk to cover duplicating and shipping costs. (In other words, the user pays to ship the disk to the manufacturer, and then from the manufacturer back to him, plus the manufacturer's labor costs, to correct a mistake that is the manufacturer's fault. We'd like to see General Motors try to get away with that one.)

Smoky Mountain Software, P.O. Box 1710, Brevard, NC 28712.

ROLL OVER ESPERANTO

THE Word Processor, compatible with CP/M-80 operating systems, is now available in Latin-based languages, enabling C-128 users to mix English, French, German, Italian, Spanish, Swedish, Danish, Norwegian, Dutch, and Portuguese in the same text. You may never need to, but at-

least you now know you can.

Palantir Software, 12777 Jones Road, Suite 100, Houston, TX 77070 (phone: 800-368-3797 or 713-955-8880).

PRICE CORRECTION

The price of Powerline Software's *Energy Manager* was incorrectly listed in October's *Scuttlebutt*. The correct price is $59.95.

Powerline Software, P.O. Box 635, New Hartford, NY 13413 (phone: 315-735-0836).

PORTFOLIO MANAGER

Designed to be comprehensive yet easy to use, *Personal Portfolio Manager* ($39.95) allows C-64 owners to organize and manage their stocks and bonds. Capabilities include recording taxable or non-taxable dividends or interest income, reconciling each brokerage account cash balance with YTD transactions, producing reports for analysis to the user's specifications via a report generator, and entering quotes manually or automatically through DJNRS or Warner. The disk can run on one or two 1541's or 1571's; a printer is recommended.

Abacus Software, 2201 Kalamazoo S.E., P.O. Box 7211, Grand Rapids, MI 49510 (phone: 616-241-5510).

ROBOTIC PROGRAMMING

C-64 and C-128 owners can learn robotic programming while constructing machine prototypes ranging from a computer plotter to dual axis robot arms with the Parsec Research Robotic Programming Kit. The 240-piece hardware set comes complete with interface and all necessary attachments, including motors, gears, lamps, sensors, switches, and electromagnetic; components are designed to allow devices to repeat operations with +−1mm tolerance.

The software is derived from Parsec's *Superforth* (see review in this issue), a language which meets industrial standards: everything users learn is transferrable to computer control systems such as laboratories and automated assembly lines.

Ten instruction models are included in the manual, but the possible configurations are limitless.

Parsec Research, 41805 Albrae Street, Fremont, CA 94538 (phone: 800-633-6335; in CA 415-651-3160).

SPIKE BLOK

The Spike Blok plugs into an existing twin outlet receptacle and converts it into six outlets with full noise and spike suppression. Two indicator lights show that power is present and that protection circuitry is working.

Tripp Lite, Chicago, IL 60610 (phone: 312-329-1777).

TELECOM NEWS

CompuServe has announced the availability of 2400 baud dial-up access in numerous cities across the United States. Rate for 2400 baud access is $19.00 per hour during standard hours and $22.50 during prime service hours.

CompuServe, 5000 Arlington Centre Blvd., P.O. Box 20212, Columbus, OH 43220 (phone: 614-457-8600).

Huttonline, which enables E.F. Hutton clients to access the firm's computers for personal account data and investment information, has expanded its services and restructured its fees. Now available are: Moody's Investor's Service (financial information on the 3600 largest public corporations in the US), Expanded Market Watch (monitor quotes on 20 issues, follow up to 800 issues automatically), Market Flash (snapshot of activity on the eight major



Spike Blok suppresses noise, spikes.
READER SERVICE NO. 274

indexes), and Rates & Trends (currency exchange rates, metal prices, economic indicator announcements, yields for government securities, and more).

New rates are 25 cents per minute from 8 a.m. to 6 p.m. weekdays and 10 cents per minute at other times.

E.F. Hutton & Company Inc., One Battery Park Plaza, New York, NY 10004 (phone: 212-742-3317).

The QuantumLink Personal Computer Network and Fort Worth-based Startext have joined the list of online information services offering the electronic edition of the Academic American Encyclopedia. For information on QuantumLink call 703-448-8700; on Startext call 817-390-7892; and on the encyclopedia contact Grolier Electronic Publishing, Inc., 95 Madison Ave., New York, NY 10016 (phone: 212-696-9750).

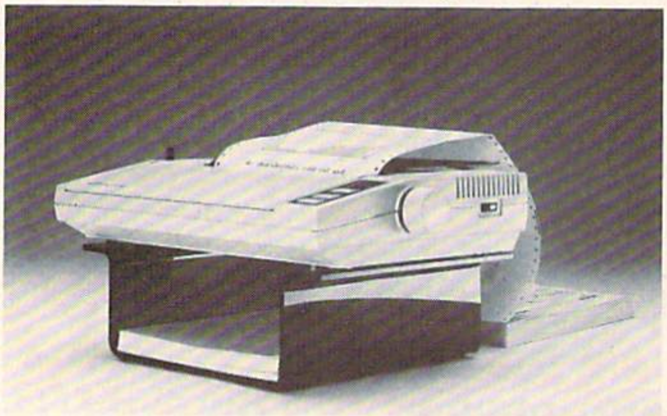
PRINTER STANDS

Why dwell on the fact that computers aren't selling anymore? At *Ahoy!* we prefer to accentuate the positive. With two models announced in last month's *Scuttlebutt* and two models described below, the printer stand market is apparently at an all-time high.

Orange Micro's 80 Column Printer Stand ($29.95), built of smoked plexiglass, is designed to hold most narrow carriage printers plus paper. Rubber feet protect the table surface.

Orange Micro Inc., 1400 N. Lakeview Ave., Anaheim, CA 92807 (phone: 714-779-2772).

The MicroFold Printer Stand comes in sizes for 80 column ($44.95) and 132 column ($49.95) printers. The stand will feed and refold printer paper via wire formed trays in an area no wider than the printer.



Orange Micro's 80-Column Printer Stand stores paper supply under the printer. Rubber feet add stability. READER SERVICE NO. 275

MicroComputer Accessories, Inc., P.O. Box 3725, Culver City, CA 90231 (phone: 213-641-1800).

PROGRAMS OF CHANCE

If *Lucky Lottery* (July '85 *Ahoy!*) hasn't made you a millionaire yet, Ridge Services offers *Lotto Picker* ($29.95), a C-64 translation of the program previously available in TI99/4A and IBM formats. The program will generate a series of random plays for all Lotto-type games, duplicating the process used by lottery commissions, thereby eliminating bias from the selections. North America's most popular lotto games are programmed in, including the new California Lottery and revised New York and Canada games.

Also newly available in C-64 format, *Pro Football Analyst* ($35.00) promises to enable the user to select NFL and USFL winners against the point spread by spending only five minutes per week analyzing a complete slate of games. Statistical input required can be obtained from any local newspaper.

Ridge Services, 170 Broadway, Suite 201, New York, NY 10038 (phone: 718-833-6335).

HAM RADIO PACKAGE

Two new releases from AC3L Software:

While it will not save files, the *One-Shot* word processor is easy to use and suitable for letters and other simple, one-time-only applications.

Designed as an aid for ham radio enthusiasts, *Band/Ayde* includes the *One-Shot* word processor described above, a scratch pad for taking notes while listening or operating, clock functions (including audio and visual alarms), and pitch, volume, and color selection.

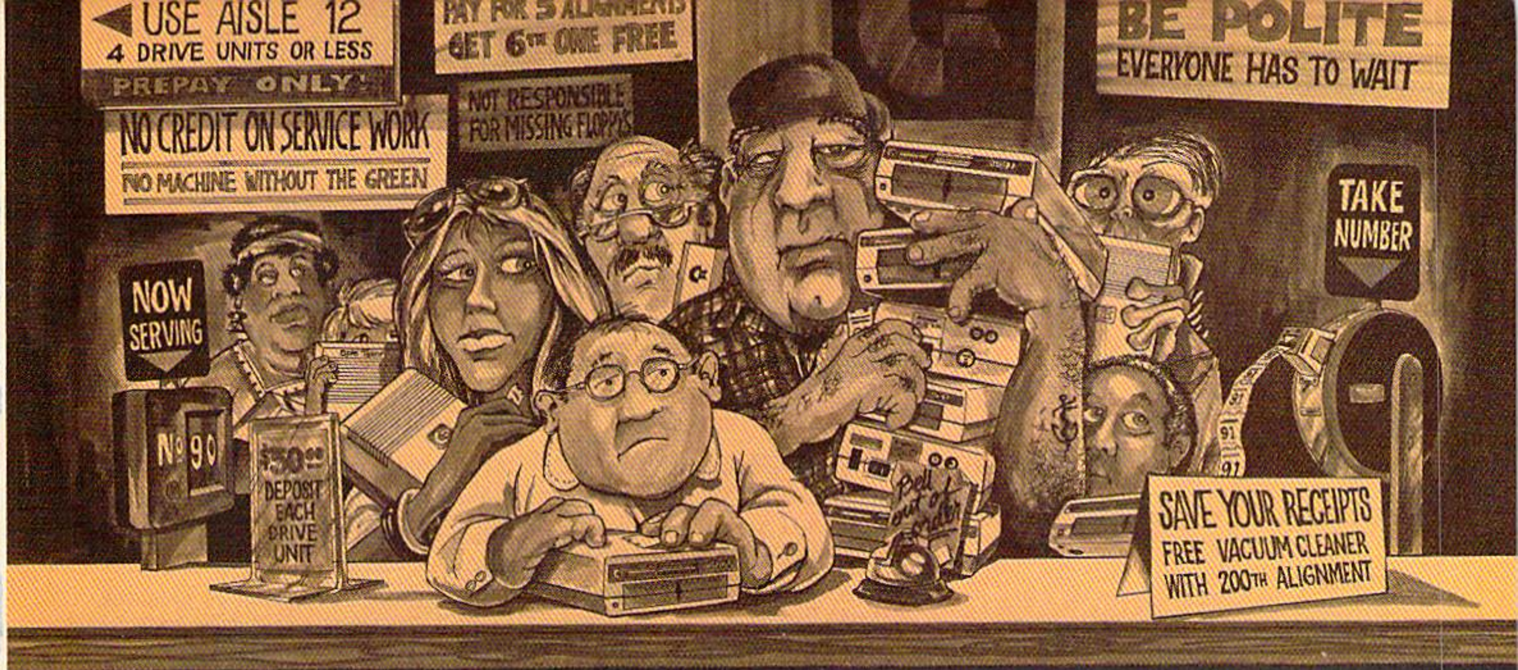
Both available on tape or disk for the C-64; $14.95 each (PA residents add 6% sales tax). Tape versions will be discontinued January 1. This applies also to AC3L's *International Morse Code Trainer* and *ESP Tester* programs.

AC3L Software, P.O. Box 7, New Derry, PA 15671.

GAME DESIGN CONTEST

A cash award of $5000 and a trip to Activision's headquarters in California will be awarded to the grand prize winner of Activision's *Game-Maker* Design Contest. A second prize of $2500 and a third prize of $1000 will also be awarded.

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Reader Service No. 266

Garry Kitchen's GameMaker: The Computer Game Design Kit, which allows C-64 owners to design games without programming knowledge. Contestants must send their work on disk, along with an official entry form, to Activision, whose panel of experts will judge the games on the basis of creativity, originality, gameplay, graphics, music, and effects.

Activision, Inc., 2350 Bayshore Frontage Road, Mountain View, CA 94043 (phone: 415-960-0410).

NET WORTH ENHANCEMENT

Scarborough Systems has upgraded its home financial management program, *Your Personal Net Worth,* to provide clearer report formatting and the ability to change the name of the data disk from the maintenance menu. Users desiring the upgrade can obtain it for $10.00.

Scarborough Systems, 55 South Broadway, Tarrytown, NY 10591 (phone: 914-332-4545).

$4.99 SOFTWARE

BCI Software has released the first 12 titles in what is intended to be a comprehensive line of C-64 software available at $4.99 per disk. These include *Inventory Control, Typing Tutor, Business Letters* (50 prewritten letters covering a variety of uses), *Word Processor, Data Base,* and assorted educational programs. Already available are several programs for $9.99 each, including *Hydrax,* an adventure game offering a $1000 prize. Coming is a $29.95 spreadsheet.

BCI Software, P.O. Box 730, Ringwood, NJ 07456 (phone: 201-835-7300).

FOREIGN LANGUAGE PROGRAMS

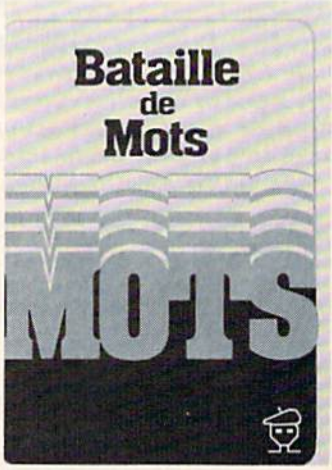
Gessler Educational Software, publisher of more than 200 foreign language software titles, has re-released a number of C-64 programs from different manufacturers in French, Spanish, and German versions. Included are Spinnaker's *Kids on Keys, Kidwriter, Snooper Troops,* and *In Search of the Most Amazing Thing,* and Davidson's *Word Attack.*

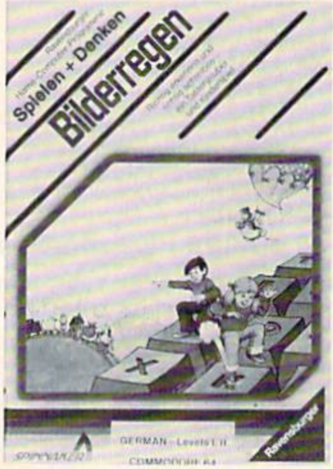
Gessler Educational Software, 900 Broadway, New York, NY 10003 (phone: 212-673-3113).

I, THE QUARRY

You're living on *Borrowed Time* as Sam Harlow, star of Activision's new illustrated text adventure, as you race to prevent your own murder. In less than a day, you must track down and grill a number of suspects found in your case files, all the while keeping an eye over your shoulder. Adding to the tension is the fact that you can control only Sam's actions; all other characters act in sudden, unexpected ways. The program includes several interactive features such as pull-down windows, point and press options, and "most used command" menus. For the C-64 and C-128; soon for the Amiga. Price is $29.95.

Activision, Inc., 2350 Bayshore Frontage Road, Mountain View, CA 94043 (phone: 415-960-0410).





C-64 software in foreign languages.
READER SERVICE NO. 137

(EEEE-YAHHH!!!)

You are the star of a Martial Arts movie so real, you'll feel it like a kick in the ribs.

KARATEKA, you have learned well the disciplines of karate...but now it is time to put your skills to the test. Your village has been ransacked, your friends and family scattered to the winds, your bride-to-be, Princess Mariko, kidnapped and cruelly imprisoned by the evil warlord Akuma. If you ever hope to see her again, Karateka, you know what you must do.

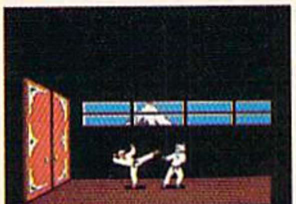
Scale the mighty cliffs that lead to Akuma's fortress. There, you will encounter the first of many palace guards. Kick! Thrust!



Parry! At every turn you will face yet another warrior, each stronger than the last.

Finally, Karateka, you will come face-to-face with Akuma himself. Here your fate will be decided. Either eternal happiness or instant death.

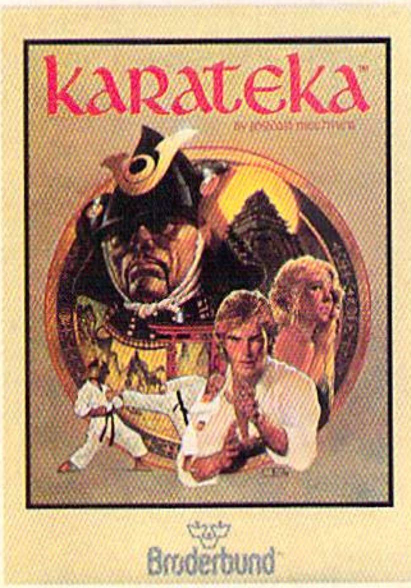
THE MAKING OF KARATEKA.



"Karateka" designer Jordan Mechner is a karate enthusiast and a stickler for realism. He used film clips of karate masters as a guide for the moves used in the game.

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KARATEKA is available for Apple, Commodore 64 and Atari personal computers. Look for it at your favorite Brøderbund Software dealer. For more information about Brøderbund products, please write us at 17 Paul Drive, San Rafael, California 94903-2101. Apple, Commodore and Atari are registered trademarks of Apple Computer, Inc., Commodore Electronics, Ltd. and Atari Corporation respectively.

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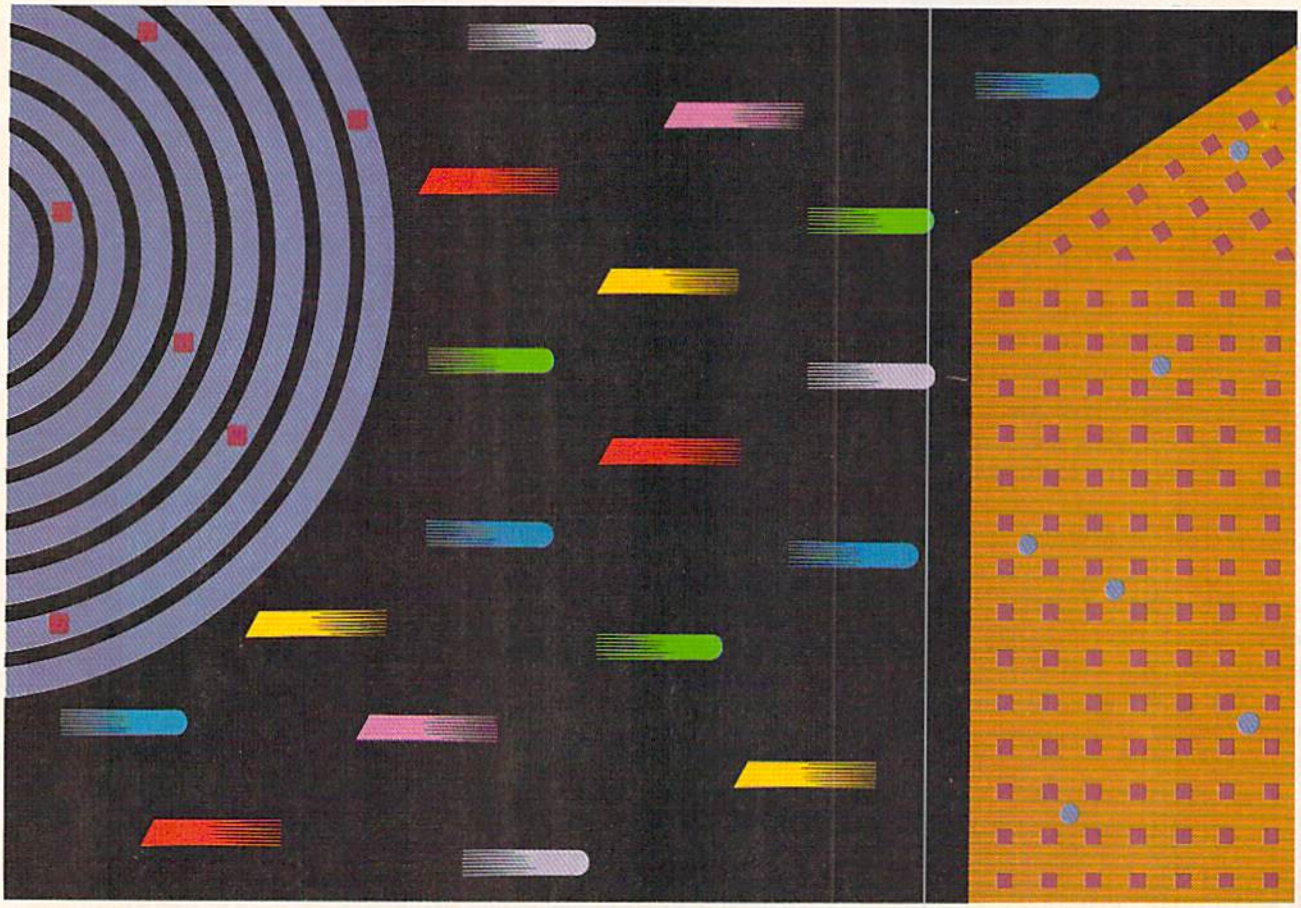
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RUPERT REPORT

THE MAGICAL LINK



JAVIER ROMERO

FILE COMMUNICATION ON THE RS-232 INTERFACE

BY DALE RUPERT

There is something magical about connecting two computers with some strands of wire and watching them share information. Last month we developed hardware and software to pass data in serial form back and forth between Commodore and IBM computers. This month we will create software so that two computers can exchange programs and sequential files over the RS-232 serial link.

All of the programs this month are written for the Commodore computers (VIC 20 and C-64). It should not be difficult to modify these programs for other computers. If you don't have two computers, get together with a friend. If you have no interest in exploring RS-232 communications, keep reading anyway. You may find this month's discussions of the keyboard buffer and sequential file handling useful for other applications as well.

We saw in last month's *Rupert Report* that it takes only three wires and two connectors to join the RS-232 ports of two Commodore computers. The Sout signal (pin M) of each Commodore (C-64 or VIC 20) goes to the Sin signal (pins B and C) of the other Commodore. Also the two grounds (pin N) are tied together.

It is very straightforward to establish an RS-232 communications channel. The channel is given a file number from 1 to 127 by means of an OPEN statement such as this:

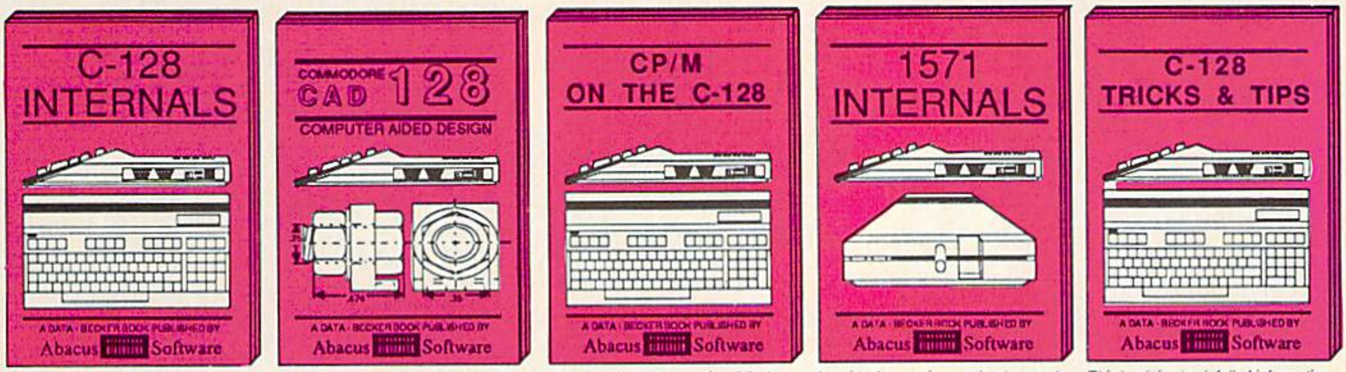
```
OPEN 2,2,0,CHR$(8)+CHR$(0)
```

The first 2 is the file number. The next two numbers are always 2 and 0 for RS-232 communications.

The value in the first CHR$ function specifies the baud rate, which is the speed of transmission. The first CHR$

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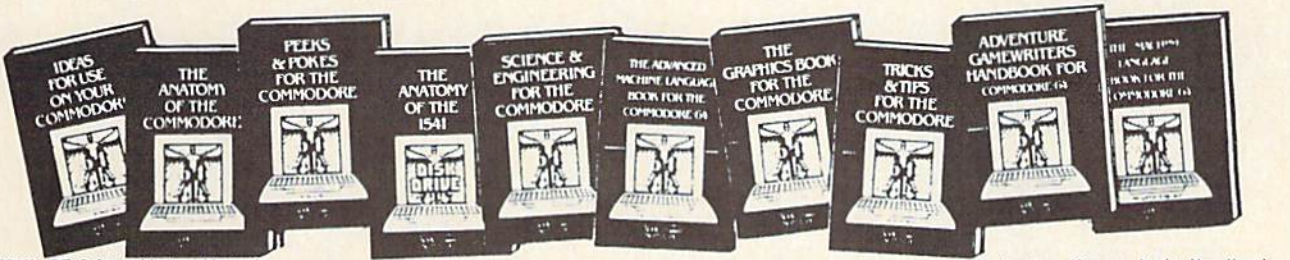
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Reader Service No. 108

argument is also used for indicating the number of stop bits and the number of data bits in each transmitted character. The CHR$(8) means "1 stop bit, 8 data bits, and 1200 bits per second baud rate." Refer to last month's article or the RS-232 Interface Description near the back of the *Programmer's Reference Guide* for the details. If you have trouble using 1200 baud, you might replace the 8 with a 6 in order to communicate at 300 baud. If your programs still don't work at 300 baud, better check the wires and connectors.

The second CHR$ function in the OPEN statement is optional. It is used for specifying the parity, the duplex mode, and the type of hardware handshaking lines being used. The value 0 gives the same results as simply omitting the CHR$. The default values implied by CHR$(0) are "no parity, full duplex, and 3-line handshaking." Parity is a means of performing error-checking on the received data, although it is not implemented in BASIC. Full duplex mode means that the Commodore will both transmit and receive data. The alternative to the 3-line (3-wire) connection that we are using is X-line handshaking, which is not implemented in BASIC.

Once the RS-232 channel has been opened, data is transmitted with the PRINT# or the CMD statements. Received data is read from the input buffer with the GET# statement.

WIRED PROGRAMS

BASIC programs are stored on tape or disk in a tokenized or compressed format. Each of the BASIC keywords is represented with a single byte value. It is possible to read such a program file and transmit it byte by byte to another computer. Unless that other computer is a Commodore, it would not be able to make much sense out of the tokenized program. To make our RS-232 programs more general, we will assume that all files to be transmitted or received are standard ASCII files. For example, a PRINT statement in a BASIC program will be transmitted as five ASCII characters rather than one tokenized code.

It is very easy for the Commodore computers to transmit programs in ASCII format. The CMD and LIST statements work nicely as the *ASCII Transmitter* program on page 119 shows.

If you want to send the BASIC program in memory to another computer over the RS-232 interface, just add the two lines of the *ASCII Transmitter* program and type RUN. You may use these lines in the direct mode also (that is, enter each one without line numbers).

Line 8 opens the RS-232 channel. The CMD statement redirects data which would normally go to the screen out to logical file number 2 instead. That logical file is the RS-232 channel. So now when the program is listed, the listing goes to the RS-232 output buffer for transmission. The listing is sent to the buffer in ASCII format.

The LIST command brings the computer back to command mode rather than to the next line of the program. Therefore to terminate the file and properly close the channel, type RUN 9 to execute line 9. Line 9 adds a CHR$(26) to the end of the transmitted program file. This is used by the receiver program which we will look at next. The PRINT#2 sends an "unlisten" to the RS-232 channel before it is closed.

The *ASCII Transmitter* program assumes that your program in memory does not use line numbers less than 12 (although you may omit the REMarks and use line numbers 0 and 1). If the program in memory to be transmitted uses line numbers 0 and 1, you may simply type the two program lines from *ASCII Transmitter* in direct mode without line numbers. You might use LIST 13– instead of simply LIST if you don't want to transmit this *ASCII Transmitter* program along with your other program.

QUICK, BRING THE BIT BUCKET!

If you ran the *ASCII Transmitter* program without another computer attached to your RS-232 port, all of the transmitted data bits fell into the proverbial bit bucket behind your computer. To capture those bits and use them, you should have a second computer programmed and ready to receive that data as it is sent.

Using and storing a program which has been received in ASCII format is quite a bit more difficult than sending the program. In fact we are going to resort to downright trickery! We will use a strategy suggested by Dr. Gerald Neufeld in his latest book, *1541 User's Guide* (Datamost, 1984). His book contains a wealth of infor-

mation on the 1541 disk drive and the various types of files available. (His clever and lucid disk drive alignment procedure alone was worth the price of the book for me.)

The *RS-232 Receiver* program on page 119 reads the incoming ASCII program data from the RS-232 input buffer character by character in lines 30120 through 30170. When a carriage return is found, the entire line is printed at the top of the screen by line 30070. "RUN 30000" is printed on the next line of the screen by line 30080. Line 30090 is where the funny business begins.

Characters typed from the keyboard go into a buffer starting at memory location 631. A count of how many characters are waiting in the buffer is stored in memory location 198. When the computer is ready to respond to keyboard input, it reads the character count and proceeds to remove the characters from the buffer to send them to the screen.

While the program is executing, the computer is not interested in reading any keyboard input (since the program does not contain any GET or INPUT statements). In the meantime, the program in line 30090 has surreptitiously put three characters into the keyboard buffer and stored and proper count in location 198.

After line 30100 is executed, the program has ended. The computer then checks the keyboard buffer to see if anything has been typed yet. Sure enough, it finds the three characters we POKEd and treats them as though we had typed them. The first character (19) corresponds to the <HOME> key. You will find the ASCII and CHR$ code numbers in an appendix at the back of your *User's Manual* or *Programmer's Reference Guide.*

Now the cursor is at the upper left corner of the screen. Remember that the first program line received from the RS-232 port is printed on the first line or two of the screen. The next character in the keyboard buffer is 13, meaning <RETURN>. Since the computer is operating in direct mode, the <RETURN> key stores the first received program line (line number and all) into memory, exactly as if we had typed the line ourselves and pressed <RETURN>.

Now the cursor is at the beginning of the next line on the screen, which says RUN 30000. The computer finds one more character in the keyboard buffer. Again it is a character 13, meaning <RETURN>. The command RUN 30000 is executed, starting the whole process again.

Thus each line of the received program is printed on the screen and entered just as if we had typed and entered each line from the keyboard. All of the received program lines are added to the *RS-232 Receiver* program. We are assuming that all of the received program line numbers are less than 30000 and that all program lines are 79 characters or less in length. Program lines longer than 79 characters are chopped off. You must edit them later if necessary.

The last program line received is followed by the CHR$(26) (end of file character) which is sent by the *ASCII Transmitter* program. When that character is recognized, the RS-232 channel is closed by line 30140. Then, as a convenience, line numbers 30000 through 30200 are printed in a column on the screen. You may delete these lines of the *RS-232 Receiver* program simply by pressing the <RETURN> key 21 times. Now you are left with only the received program in memory which you may either run or save.

Now to briefly review the process,

1. Load the *RS-232 Receiver* program into computer A and run it.
2. Load the program to be transmitted into computer B and then add lines 8 and 9 from the *ASCII Transmitter* program to it.
3. Enter RUN 8 on computer B.
4. When all lines have been received by computer A, enter RUN 9 on computer B to close the channel.
5. Delete the lines of the *RS-232 Receiver* program in computer A by pressing <RETURN> 21 times.
6. If necessary, edit any lines of the received program in computer A originally longer than 79 characters.
7. Save and/or run the program in computer A.

No doubt some of you may be wondering why we would go to all this trouble when we could simply load the program from computer B's disk or tape into computer A. You are absolutely correct if both computers have compatible tape or disk formats (such as two Commodores).

The reason for using the RS-232 ASCII format is that it is a universal way to transport information. The Com-

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modore and IBM disk formats are totally incompatible, yet the two machines readily exchange programs in ASCII format. (Of course the two forms of BASIC are not totally compatible, but that is another story. Most general-purpose commands run equally well on both machines.)

THE FINAL LINK

Some computers do not have the convenience of the CMD command to send files in ASCII format to the RS-232 output buffer. It is useful for computers to be able to communicate sequential data files as well as programs. Therefore we will write a program to read and transmit sequential disk files from one computer. We will develop another program to receive these files and write them to the screen, a printer, or a disk.

The *Sequential Transmitter* program on page 119 is very straightforward. After opening the RS-232 channel, the program asks for the name of the file to be transmitted. Line 130 opens that disk file. Lines 140 through 190 read the file byte by byte, sending each character to the RS-232 output buffer. Line 170 filters any unprintable characters, and line 180 displays each printable character from the input file on the screen.

If the status variable ST is zero after reading from the disk file in line 140, the end of the file has not been reached. Line 190 tests that value and branches back to line 140 if the end has not been found. The value of ST is changed by line 160. That is why we must save its value at line 150 in a separate variable.

Once the end of the input file is found, line 200 is executed. A CHR$(26) is transmitted, indicating the end of the file. The RS-232 channel and the disk file are then closed.

Completing the repertoire of RS-232 programs is the *Sequential Receiver* program on page 120. This program allows the user to receive a sequential file on the RS-232 link and either store it on disk, send it to the printer, or display it on the screen.

Line 90 establishes the RS-232 channel. Line 100 clears the receiver buffer. The quantity (ST AND 8) will equal 8 when the receiver buffer is empty. Line 110 allows the user to specify the destination of the incoming file. Lines 120 through 140 steer the program in the right direction.

If the printer is selected, an output channel to device number 4 is opened in line 150. If the file is to be saved on disk, line 160 requests the filename, and line 170 opens a sequential file with that filename. (You may replace the '8,8' in line 170 with '1,2' for tape storage. You should also delete the '+",S,W"' in that line.) If the file is to be displayed on the screen, line 180 opens device number 3 which corresponds to screen output.

The receiver buffer is read by line 200. Each character is written to the selected device in line 210. If the "end of file" CHR$(26) has been received, lines 230 and 240 properly close the RS-232 channel and the output device; otherwise the program goes back for more data.

You should be aware of a couple of potential problems. If screen output is selected, all characters, even non-displayable characters, will be written to the screen. These characters may make the display unreadable. A solution to this is to use the same type of filter as in *Sequential Transmitter*, line 170.

The other possible problem is that the receiver buffer may overflow if the *Sequential Receiver* program can't keep up with it. The solution to this problem is either to use a slower baud rate (replace the 8 in line 90 with a 6 for 300 baud) or to implement some software handshaking. The handshaking program last month should provide a model for you to implement. Since there will not necessarily be carriage returns throughout the sequential file, as there were for a program file, you may prefer to stop the transmitting program after a specified number of characters. Once the receiver program has received that number of characters, it will send a handshake character to the transmitter, which then sends the next set of characters.

With the capabilities of communicating over the RS-232 link, it is possible to open a whole new realm of applications for your computer. There are numerous laboratory instruments that provide an RS-232 interface. Let your computer become a data logger or a digital oscilloscope, periodically reading data from a digital voltmeter, for example. Once the measurements are stored in the computer, your software may filter, graph, or analyze the data. It may even provide control signal outputs based upon the measured voltages.

Remember that you need some additional hardware to provide true RS-232 signal levels. Use the circuit diagrams from last month for communicating with devices besides other Commodore computers. See what kinds of magic your computer can perform with its RS-232 serial link. *SEE PROGRAM LISTINGS ON PAGE 119*

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STREAM

Banner Printing Utility for the C-64

If you had both a computer and a printer and wanted to put your ideas across in a BIG way, how would you do it? Naturally you would want to print a banner. First, though, you would need a program to help you. In its simplest form such a program would easily produce your message in large letters using a built-in character set. All that would be required is that you enter your message; the program would do the rest. Such a program could be enhanced in a number of ways. For instance, you might want to vary the size of your letters. Or you might want to be able to control the "pixels." For instance, you might want to have your letters composed of stars or hearts.

Streamer Font is such a program. It provides you with a number of enhancements so that you can easily create your banners. There are two listings. *Streamer Font* prints messages whereas the file, *Sequela*, supplies you with a complete character set. *Sequela* is a simple but elegant font that is appropriate for most messages. And if you want more fonts – make them! *Streamer Font* is also a full-featured character editor. You can design up to 40 characters for one font with each character having a resolution of 24 X 20. If you've worked with the 8 X 8 programmable screen characters you'll appreciate this degree of resolution. And you'll find it easy to design your characters with such commands as scrolling, mirror image, flipping, symmetry, and many others. Whether you're designing a font or drawing pictures, you'll find the program easy to use. Best of all, *Streamer Font* is written in machine language so the commands are fast.

Since it is in machine language, you'll need to type it in with *Flankspeed* (see page 116). Before you LOAD *Flankspeed*, however, you must set some pointers. These will place *Flankspeed* high in the memory and prevent it from being overwritten by *Streamer Font*. Enter the following, then LOAD *Flankspeed:*

```
POKE46,25:POKE6400,0:NEW
```

Now LOAD and RUN *Flankspeed*. Enter in the hexadecimal addresses and type in *Streamer Font*. Once you've finished typing in the program SAVE it and reset your computer. Since *Streamer Font* acts like a BASIC program, you simply LOAD and RUN it.

After a brief title page, a pixel grid unfolds and you're ready to go. Two characters can be displayed at a time, along with an indicator that will tell you which character you are currently working on. The screen is split in half, green on one side and black on the other. Each half is made up of small squares, the pixels of your character. Only the bottom line is free of these squares. Instead, this line displays letters A-Z, numbers 0-9, and a few punctuation marks. Most conspicuous, though, are the two flashing cursors: one to keep track of the pixel that you're working on, and the other, at the bottom of the screen, to indicate the current character.

Characters are drawn with your joystick. To plot a point, simply press the fire button when your pixel-cursor is on an empty square. Hold the button down and it will continue to draw. To erase, press the button while over a plotted square and that will set you in erase mode. If you wish to change the speed of the cursor, press SHIFT-V. The bottom line will be momentarily replaced with a message asking you to choose a number between 0 (slow) and 9 (fast).

As you move about the screen you'll notice a few things. If you move from one side of the screen to the other, the background colors switch and the character-cursor adjusts to a new character. You'll see that the green background follows your pixel-cursor while the character-cursor keeps track of the letter that you're working on. In other words, the green background corresponds to the character that the second cursor is pointing to.

Nothing happens when you try to move the pixel-cursor off the screen at either the top or bottom; it just reappears at the other end. But if you move offscreen to the right or left, a different character appears. If the letters A and B are on the screen and you move you cursor off to the right, the letters B and C will appear. Push your joystick right and hold it, and your cursor will move through the entire character set, eventually ending up back at the letter A.

To page quickly through the characters use the left and right cursor keys. Hold down one of these keys and if there's a font in the memory, you'll see huge letters flash across the screen. To find a particular character, just watch the character-cursor and stop when it gets to your letter. Faster yet, just press the letter that you want and you'll arrive there instantly.

DESIGNING CHARACTERS

There are a number of commands at your disposal to

ER FONT

By Bob Spirko

aid you in drawing individual characters. Since many letters are symmetrical it makes sense to include a symmetry mode. Press the back arrow and whatever is drawn on one side of the character will be duplicated on the other side. Press the back arrow again and the symmetry mode will be turned off. Also, you can borrow from other letters. If you wanted to make a Q from an O, press f8 and save the O in the buffer. Then slide over and drop the O on Q's workbench with f7. Add the tail and you have your Q. If you want to make some changes to a character but are concerned about mangling it beyond use, tuck the letter away in the buffer for safekeeping.

The mirror image and flip keys are also handy. Press SHIFT-M and the letter will read backwards. Press SHIFT-F to flip a character upside down. Since these keys are frequently used there are also alternative keys to spare you from pressing the SHIFT key. Use the pound sign (it sort of looks like an f) to flip and the negative sign for mirror images. And to reverse the fields of any letter, press SHIFT-R.

Sometimes you'll complete a character only to realize that it's not centered. Not to worry. Use the function keys 1 to 4 to scroll with wraparound. If you press fl, for instance, your character will appear to SHIFT to the right. The pixels that move off the right side will emerge on the left. Similarly, f2 scrolls left, while f3 and f4 scroll down and up.

When you first RUN the program, *Streamer Font* automatically clears the entire font memory. After this, a switch is turned off. When you exit and reenter the program, the font memory will not be cleared, and your character set will remain intact. This means that if you SAVE *Streamer Font* after RUNning it, it will be SAVEd with the switch off. When you RUN this program it will not automatically clear the memory. A minor point, since you can clear it manually, but it's something you should be aware of. In any event, it's nice to enter *Streamer Font* and be greeted with a clean picture rather than a cluttered screen.

To clear the font memory press CLR. As a precaution, you will be asked: "ARE YOU SURE?". Hit Y, and all the characters will be erased. If you want to delete only the current character, press DEL. Pressing HOME, as you would expect, takes you to the upper left corner of the current character.

One more thing on character design. Most of the streamers that you create will probably run horizontally, but on occasion you may want to create a banner that hangs down. Creating vertical streamers means that your letters will appear sideways on the screen, making designing awkward. Don't turn your monitor on its side! Instead, toggle SHIFT-D. This will create a window in the lower left corner of the screen and display a rotated version of your character. When you draw a letter sideways it will appear upright in the window.

STREAMER FONT REFERENCE CHART

DEL: Delete current character
CLR: Clear font memory
HOME: Position cursor in upper left corner
Left and right CURSORS: Move to next character
A-Z: Move to specific letter
0-9: Move to specific number
SHIFT 1-5: Change character size

f1: Scroll right
f2: Scroll left
f3: Scroll down
f4: Scroll up
f5: Print streamer
f6: Change printer characters
f7: Recall character from buffer
f8: Store character to buffer

Back arrow: Symmetry mode
SHIFT-D: Display rotated character
SHIFT-F: Flip upside down
SHIFT-L: Load font from disk
SHIFT-M: Mirror image
SHIFT-R: Reverse field
SHIFT-S: Save font to disk
SHIFT-V: Change cursor velocity
SHIFT-X: Exit to BASIC

LOAD AND SAVE

Once you've designed your font you'll want to SAVE it on disk. Press SHIFT-S and you'll be asked for a file name. Enter the name and hit return. You'll notice that you can use DEL but no other screen-editing keys. If all goes well your creation will be SAVEd to disk. If not, you'll get a "DISK ERROR" message; hit any key to con-

Continued on page 146

BASIC Relocator

For the C-64

By James E. Hosek

BASIC Relocator is a short utility that sits at the beginning of your BASIC program. When you RUN it, *Relocator* will move your program to make room for character sets, sprites, extra text screens, etc. Then, it will delete itself and RUN the rest of the program in its new location. You will never again have to worry about setting up pointers before loading up a program.

ENTERING THE PROGRAM

To use *BASIC Relocator* type in the listing on page 144. Be sure that the proper number of A's are included in lines 1 and 2. This makes space for the short machine language routine that does the relocation.

Line 1100 contains the value of the memory page to move the BASIC program to. Normally, programs begin at page 8. Each page is made up of 256 bytes. Therefore, it you needed 2K of space to make room for a character set, you would set this value to 16.

After you have entered the program, be sure to save a copy to disk or tape. This is a generator program and the value in line 1100 needs to be changed if you need a relocator for a different location. To run the generator program, type 'RUN 1000' (Not 'RUN'). When the program is finished, the READY prompt will appear. If there was an error in the DATA statements, load back the copy from tape or disk. The one in memory has already destroyed itself.

After you RUN the generator, LIST it. There should be only one line which looks like the following:

```
1 SYS2063:END:REM"-RELOCATOR-"
```

The characters which appear between the quotes are the actual program itself. There should be 115 graphics characters altogether. Even though the Commodore 64 editor allows only 80 characters per program line, BASIC allows more.

NOTE TO *INSTANT BUG REPELLENT* USERS...

If you proofread *BASIC Relocator* by using the *Instant Bug Repellent* printed in our November '85 issue, rather than the *Bug Repellent* program we publish every month (see page 116 of this issue), you will find that some of the *Bug Repellent* line codes listed alongside the program lines on page 144 will not match up. These are the correct codes for use with the *Instant Bug Repellent:*

1:	JE	920:	LI	1010:	MO	1050:	MO	1090:	JB
2:	KE	930:	FF	1020:	FA	1060:	AA	1100:	ON
900:	JD	940:	JD	1030:	OA	1070:	PB	1110:	AC
910:	DN	1000:	DN	1040:	HB	1080:	KE		

You are now ready to add on your own program. If you have a merging utility, now is the time to use it. Otherwise, just add on the rest of the lines.

At first, you will not want to use the relocator when testing out the program. If you need to make changes, the relocator part will already have deleted itself. To get around this add the following line to your program:

```
0 GOTO 10: REM THE START OF YOUR PROGRAM
```

This will skip over the relocator program. As a result, you will need to reset the pointers to the start of BASIC manually while debugging the program. Once you are finished, simply delete line 0 and save the program. To RUN the program with active relocator, turn off the computer and turn it back on. Load up the program and RUN it. Line 1 will be deleted once the program is safely in high memory, and it is now safe to load up your character set or sprites.

HOW BASIC RELOCATOR WORKS

The program in line 1 is a short machine language routine. When you type 'RUN', the SYS2063 sends control to it.

It starts by calculating an offset by means of the value provided in line 1100 of the Generator program. The BASIC program is then transported to the new location, byte by byte. Once this is done, the relocator must calculate the new pointers within the BASIC program itself.

It does this by adding the offset to the high byte of the pointer at the beginning of each BASIC line and using this to find the next pointer. It then saves the new pointers to the beginning and end of the program to their zero page locations. When this is done, it puts the following string into the keyboard queue:

```
1 CHR$(13) R SHIFT-U CHR$(13)
```

Then control returns you your BASIC program which is still running in its original location. Of course the next command encountered is the END statement in line 1. BASIC will then check the keyboard queue and execute the commands in it.

1 CHR$(13) will cause line 1 to be deleted. However, BASIC is now seeing the program in its new location and will delete the line from there. Next, the R shift-U CHR$(13) is shorthand for RUN, and your program will be executed in its new spot. □

SEE PROGRAM LISTING ON PAGE 144



Reader Service No. 267

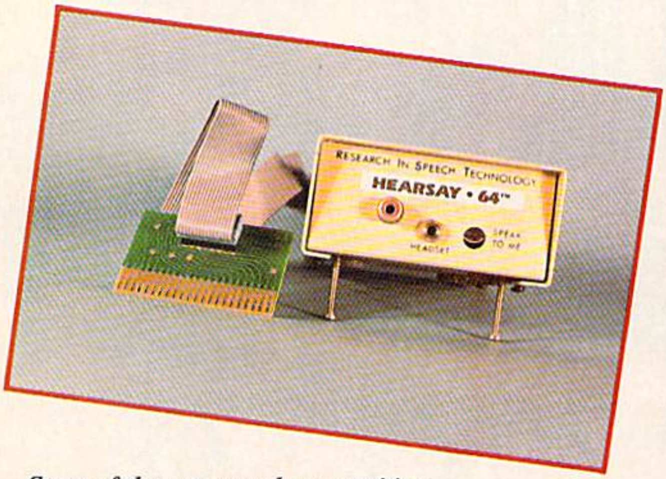
SPEECH SYNTHESIZERS

For the Commodore Computers

PART II

By Morton Kevelson

Last month we auditioned Magic Voice, Voice Messenger-Speech 64, Easy Speech 64, Voice Master, and Voice Command Module. This month we speak our final piece with Hearsay 64, LIS'NER 1000, and VIC-Talker.



State-of-the-art speech recognition.
READER SERVICE NO. 253



Believe it or not, a new VIC accessory.
READER SERVICE NO. 254

VIC-TALKER

Talktronics, Inc.
27341 Eastridge Drive
El Toro, CA 92630
Phone: 714-768-4220
Price: $89.00

Talktronics is definitely the new kid on the block. In our opinion they are destined to make an imprint on the Commodore speech synthesis market if the VIC 20 prototype of the VIC-Talker, which we looked at, is any indication. "What?" you may ask, "a new VIC 20 product at this stage of the game?" We were as surprised as you. However, it appears that the similarity between the VIC 20 and C-64 operating systems allowed for the development of both versions at minimal extra cost. As a result, all the VIC 20 users in our audience will benefit.

Talktronics is the outfit which has been running the full-page color ads you have probably noticed. You will have also noticed amazing claims about their speech synthesizer. This is one case where the product delivers what is claimed. A surprising collection of features and technology has been crammed into the VIC 20 cartridge case. It leaves us very curious as to how it will all be squeezed into a half-sized C-64 cartridge.

THE HARDWARE

The VIC-Talker is based on the SSI 263P speech synthesis chip. This phoneme-based synthesizer differs from the SPO256-AL2 in that it allows for the control of rate, pitch, and inflection. The sixteen-kilobyte operating system in ROM does a good job of applying these features to the synthesis of speech. The glass-epoxy, double-sided, printed circuit board also carries two kilobytes of electrically erasable programmable read only memory (EEPROM) and one kilobyte of RAM.

Some sophisticated onboard bank switching allows this 19-kilobyte collection of memories to occupy only the eight-kilobyte cartridge block in the VIC 20 memory map. This block, located at addresses 41920 to 49151 ($A000-$BFFF) is normally used for plug-in game cartridges. As you would expect, most cartridge games will not work with the VIC-Talker. There is one notable exception. The

five Scott Adams text adventures released on 16K cartridges for the VIC 20 will work. Of course you will need a cartridge expansion board to allow the use of at least two cartridges at once. The Scott Adams cartridges do not conflict with the VIC-Talker, since they reside at addresses 16384 to 32767 ($4000-$7FFF).

Incidentally, we have found the old Scott Adams VIC 20 adventure game cartridges to have a notable, hitherto unnoticed, feature. They are excellent examples of proper use of the Commodore Kernal. The Kernal is the jumbo machine language jump table which Commodore recommends to all third party programmers. If you follow this rule in machine language programming, your program should be transportable across machines. It turns out that Scott Adams did follow the rule. As a result, the contents of these VIC 20 cartridges can be saved to disk, LOADed into a C-64 (at the same address), and they will work, without any modification! How's that for a 16 kilobyte M/L program?

Getting back to our review, the VIC-Talker can be set to intercept the output to any hardware devices. The data is then sent along to the original device after it is vocalized. This is what allows the VIC-Talker to vocalize the text output of the Scott Adams adventures.

Installation of the VIC-Talker is simple. Just plug it into the cartridge port. Since it is completely self-contained, additional expansion RAM is not required. A five-pin DIN jack at the back of the cartridge accepts the video cable to either the VIC 20 RF modulator or a video monitor. The short cable which hangs from the cartridge is terminated in a five-pin DIN plug which goes into the VIC 20 video port. An onboard audio mixer combines the sound from the VIC 20 with the synthesized speech.

THE OPERATING SYSTEM

The VIC-Talker looks like two additional hardware devices to the VIC 20. Device number 20 is the actual speech device. Information is sent to it by OPENing a data channel very similar to a printer or disk drive. Device number 21 is the VIC-Talker's control channel, which functions in a manner very similar to the command channel on the disk drive.

TABLE OF VIC-TALKER COMMANDS

An (n=0..F)	Sets volume
F+	Increments filter frequency
F–	Decrements filter frequency
Fmn (mn=00..FF)	Sets filter frequency
I+	Increments inflection frequency
I–	Decrements inflection frequency
Ilmn (lmn=000..1FF)	Sets inflection frequency
R+	Increments rate of speech
R–	Decrements rate of speech
Rn (n=0..F)	Sets rate of speech (8 to 1 range)
IM	Sets immediate inflection mode
T	Sets transitional inflection mode
P	Exception programming mode
AON, AOFF	Automatic inflection mode on & off
FON, FOFF	Fraction mode on & off
PON, POFF	Punctuation mode on & off
1, 2	Selects voice one or two
RESET	Clears EEPROM
TALKmn	Set talking channel to mn

On power up the VIC-Talker does a reasonably good job of translating text to speech. It was the only synthesizer which vocalized our own test word (GHOTI) anywhere near the correct way. (GHOTI is pronounced "fish"– GH as in lauGH, O as in wOmen, TI as in naTIon.) The translation routines are part of the operating system. They handle all text-to-speech conversion for the VIC-Talker. They are sufficiently complete that the creators of the VIC-Talker left no way for the user to access direct phoneme speech synthesis directly. At least the preliminary manual neglects to mention the availability of this feature.

As with all the hardware speech synthesizers we have encountered, the VIC-Talker has its own peculiar accent. To get around this, the VIC-Talker lets you create exceptions to its rules. This is where the two-kilobyte EEPROM comes into play. All exceptions are stored in the EEPROM. Thus they are not lost when the computer is turned off. Programming the EEPROM is simple enough that you should consider saving custom dictionaries on disk or tape for rapid entry as needed.

The VIC-Talker accepts over a dozen commands for customizing the operating system to a specific application. These are summarized in the accompanying table. Among these is the ability to vocalize a BASIC program listing. This supports program proofreading by simply LISTing it to the screen, since all of BASIC's keywords are recognized (and vocalized) by the VIC-Talker. Just be sure to turn on punctuation mode before starting.

The VIC-Talker has two built-in voices. The modes for each voice can be independently set. This allows, for example, the reading of text in one voice while punctuation is vocalized by the other voice. The availability of the two voices combined with the variety and complexity of the commands make controlling the VIC-Talker a fairly complex task. The manual recognizes this by separating the commands into two groups, beginner and advanced. The former group are the ones most likely to be used. The latter group forms the complete set.

The VIC-Talker performed well. We are looking forward to seeing what the C-64 version can do. ☐

HEARSAY 64 (formerly The Recognizer)
Research In Speech Technology, Inc.
1825 74th Street
Brooklyn, NY 11204
Phone: 718-232-7266
Price: $59.95

LIS'NER 1000
THE MICROMINT, INC.
25 Terrace Drive
Vernon, CT 06066
Phone: 800-635-3355 (orders)
203-871-6170 (technical)
Price: $149.00 (assembled)
$119.00 (kit)

This product represents the current state of the art in speech recognition technology for the Commodore 64. You may wonder why we're presenting a combined report on the offerings from two different suppliers. The fact is that for all practical purposes these products are functionally identical. They differ primarily in the three "p's" (price, packaging, and presentation). A little historical information is required to see how this came about.

A HISTORY LESSON

In the late 70's, Milton Bradley, a major toy manufacturer, embarked on a research project to develop low cost speech synthesis and recognition for their product lines. The results of these labors were widely disseminated among the technical community with no strings attached. This data forms the basis of many of the speech products presently available.

At about the same time the General Instruments Company (GI), a major semiconductor manufacturer, was getting involved in the manufacture of large scale integrated circuits for speech synthesis. The SPO256 and the CPO256-AL2 are both GI products. You will note that these are the chips used in the *Ahoy!* Babbler construction project in this issue. The SPO256-AL2 is also the heart of the Welwyn Currah Voice Messenger reported on last month.

The most recent GI product is the SP-1000, a super speech processor with both voice synthesis and voice recognition capability, which incorporates the latest results of the Milton Bradley research efforts. This chip is also the heart of Hearsay 64 and the LIS'NER 1000.

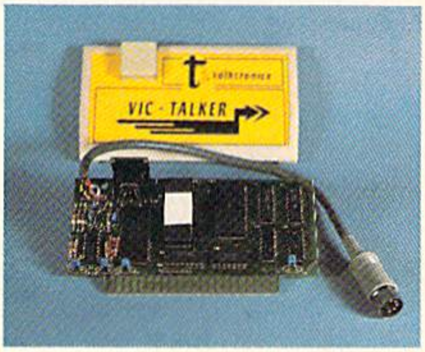
As time went on several GI employees (as employees often will) went their own ways. One, Dennis Intravia, formed his own consulting company (Mind's Eye Technology, 21 Anita Place, Amity Harbor, NY 11701; 516-848-3544). He developed a speech recognition and synthesis device based on the SP-1000. This was subsequently presented as a construction project by Steve Ciarcia in the November 1984 issue of *Byte* magazine. At this point the project became another offering from THE MICROMINT, the company which distributes all of Ciarcia's *Byte* construction projects.

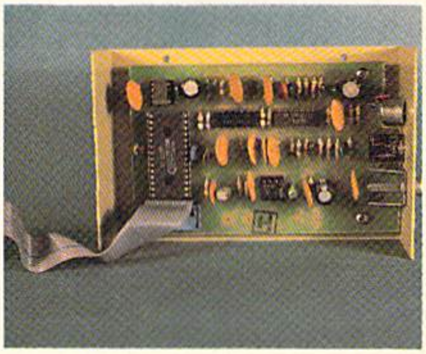
Steven Veltri, another ex-GI employee, is now the V.P. of Sales and Marketing for R.I.S.T. As you might expect, the design for the LIS'NER 1000 was also turned over R.I.S.T. It was perceived, and rightfully so, that the market for the two companies was sufficiently diverse so as to present no conflict of interest. MICROMINT directs its products to the advanced hobbyist and experimenter. R.I.S.T. on the other hand concentrates its efforts on the general user in the mass market. Along with the hardware design came a detailed concept for the user interface and software. In order to better manage the software development, MICROMINT undertook the writing of the Apple version while R.I.S.T., namely Ed Garrity, did the Commodore 64 version.

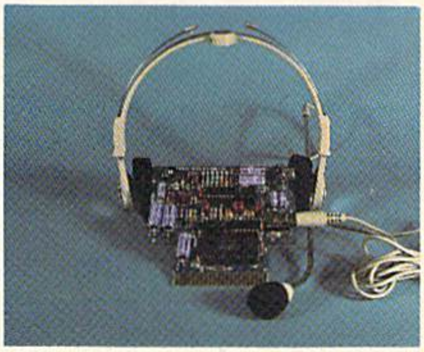
This is where we stand today. If you should happen to obtain the MICROMINT offering you will still be greeted by Ed Garrity's message and the R.I.S.T. copyright notice when you boot the software.

WHAT THEY DO

Last month we presented *Easy Speech*, a software package from R.I.S.T., which when used in conjunction with the Welwyn Currah Voice Messenger gave the C-64 the power of speech. The implementation was completely transparent to the operating system and the user. Many commercial software packages would







Top to bottom: ***VIC-Talker uses SSI 263P chip; Hearsay 64 is similar to LIS'NER 1000 (Reader Service #260)***

work with it without modification.

The Hearsay 64 and the LIS'NER 1000 perform the complementary function. They bequeath upon the C-64 the ability to recognize and act upon your spoken word. Verbal commands are entered into the input buffer (and usually the screen as well) just as if they were typed in and entered from the keyboard. These are speaker-dependent, isolated word systems. This means that lengthy exchanges, as demonstrated by Captain Kirk, which begin with "Computer..." and end with the mechanical response of "WORKING" just won't work with the C-64. You will have to utter your commands one word or

phrase at a time. Each utterance may be up to two seconds in length. Nevertheless, given the overall system costs, the results are impressive.

THE PRODUCTS

The LIS'NER 1000 and Hearsay are functionally identical, that is, either software package will work with either hardware module. However, as we mentioned, the three "p's" are quite different.

The LIS'NER 1000 is an open, unadorned circuit board whose gold plated edge connector plugs directly into the expansion port of the C-64. In other words, the entire works are exposed to all observers as well as the ambient environment. It is supplied with a separate headset microphone which plugs into a miniature jack on the board. An RCA jack is supplied for audio output if and when the speech synthesis software for the SP-1000 is ready. The software provided with the package is unprotected. The making of backup copies is encouraged. The accompanying manual, in looseleaf format, describes the operation, the hardware, and the software in some detail.

The Hearsay hardware is completely enclosed in a sturdy metal case. The expansion port edge card connector, which is not gold plated, hangs off the end of a length of flat ribbon cable. This allows the module to be conveniently positioned. The object is to bring the module to the vicinity of your mouth so as to be in reasonably close proximity of the built-in microphone. A headset microphone is available for $5.95 to those who send in their warranty cards. We recommend you buy the headset. The accompanying manual, in a reduced half-size format, includes detailed descriptions on how to use the system. The manuals were in many ways nearly identical in both form and content. The Hearsay manual did include additional explanatory paragraphs for what were perceived to be the more difficult topics. However, some of the detailed technical explanations of the hardware and software were omitted.

Both manuals would benefit from the attentions of a good editor. Fortunately the software, which is supported by extensive menus and screen prompts, is nearly self-sustaining. This was surprising in that Steven J. Veltri, who undoubtedly had a hand in the preparation of the documentation, has authored a very readable and informative book on speech synthesis. *How to Make Your Computer Talk* ($9.95), published by McGraw-Hill, is primarily a series of speech synthesizer construction projects, based on the SPO256-AL2, for most popular personal computers. The Commodore versions are very similar to the Babbler project in this issue. This is not surprising, as all are based on a sample circuit in the General Instrument data sheet for the SPO256-AL2. The book also includes several chapters on the theory of speech synthesis as well as an excellent allophone table for the SPO256-AL2.

THE SOFTWARE

Copy protection aside, the main routines of the Hearsay software were identical to the corresponding routines in the *LIS'NER 1000.* The Hearsay manual also included a paragraph threatening the usual dire consequences for any attempts to copy the disk. A backup copy is available for $5.00.

The bulk of the operating system is a sophisticated editor which allows you to conveniently train the templates used by the recognition package. Training a set of templates is a multistep process. First you enter a set of prompts. These are only used to prompt the speaker as to what to say when actually training the commands. Next, the actual commands are recorded. These will be the characters which the operating system will enter into the keyboard buffer. The command strings may be BASIC commands, including non-printing characters such as carriage returns (CHR$(13)). They may also be application-specific, such as the various *Zork* commands included in the demonstration file. A command string may be up to 16 characters long.

Templates are set up with up to 64 words. These are organized in groups of eight. Scanning the templates is a time-consuming process. It can take three seconds to scan all 64 words. This process can be speeded up by defining a syntax for each group of eight words. In this step, a set of group pointers are recorded with each group. These pointers confine the searches to groups of related words.

The last setting is the rejection threshold. This sets the rejection ratio of the stored 108-byte template against the incoming word. A rejection ratio of one (the default) will correctly recognize a phrase about 95% of the time. Moving up to four will guarantee recognition better than 99% of the time. The tradeoff is sensitivity. A high rejection ratio also results in a large number of incidents of no phrase at all being selected.

The templates are saved on disk for subsequent loading. This last function is performed by the Loader/Linker software. To avoid possible conflicts with other software, the templates and recognition routines can be loaded into various locations on the C-64. These are the top of BASIC RAM, the RAM under the BASIC ROM, and the RAM under the Kernal ROM. The LINKER portion of the LOADER is for two or more users. It allows up to eight templates to be linked. Of course the size of each template is reduced correspondingly.

Once loaded, operation of the recognition software is completely transparent to the system. The process can be toggled on and off by a CNTRL-V keystroke. Of course either the Hearsay 64 or the LIS'NER 1000 hardware must be installed as well. Nothing happens until a sound is detected above the recorded background noise threshold. The templates are then scanned and if a match is found the appropriate command string is entered into the keyboard buffer.

CONCLUSION

Either package is an effective voice recognition system for the Commodore 64. However, do keep in mind that the state of the art, at this price level, is still somewhat limited. This is in no way meant to discourage the capabilities of these packages in performing their intended tasks. □



YOUR MISSION: TO EXPLORE NEW WORLDS

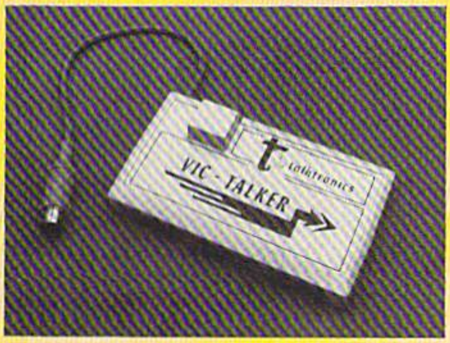
Tap into an exciting computer resource available for the VIC-20 and C64 computers: synthesized speech.

Talktronics brings to you two extremely powerful plug-in speech synthesizers to let your computer sound off in ways you never knew were possible.

VIC-Talker and **64-Talker** enhance your educational programs and games, aid the handicapped and generally increase computer "friendliness".

Look at these sophisticated features:

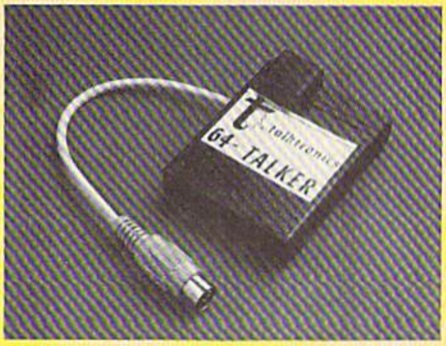
- Self contained firmware – disk or tape not required for synthesis.
- Audio mixer to combine computer generated sounds with the synthesized voice for **VIC-Talker** or **64-Talker.**
- Two user-programmable voices that can be as varied as your imagination – from chipmunks to robot warriors.
- Translation of ordinary text directly to synthesized speech using pronunciation rules for English.
- Nonvolatile user-programmable exception word memory permits special pronunciation or translation of words you select and is retained when power is off.
- Contains rules for pronunciation of text, numbers, punctuation and BASIC command words.
- Accurate translation of number strings in decimal, dollars and cents, fractions, BASIC equations, time and phone numbers.
- Easily controlled with simple commands from BASIC or machine language – like using the printer or disk.
- **Proofread** mode announces the punctuation in a different voice – lets your computer "speak" BASIC program listings.
- Change the voices along with speaking text. Make it sing!
- The voice comes out on the TV or monitor.



VIC-Talker and 64-Talker are priced at $89 each and are available from

Talktronics, Inc.
27341 Eastridge Drive
El Toro, CA 92630

(714) 768-4220
9 AM - 5 PM, PST



VIC-20 and C64 are registered trademarks of Commodore Business Machines, Intl.

Build the Ahoy! Babbler/Talking Clock

A Speech Synthesizer for the C-64, C-128, or VIC 20

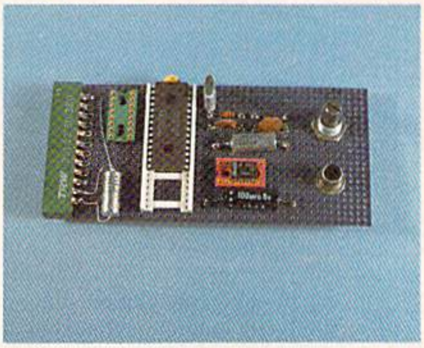
By Isaac Michalowski and Morton Kevelson

If you are reasonably adept at the assembly of electronic projects, you can easily construct your own speech synthesizer for a total cost of about $20. The *Ahoy!* Babbler circuit board, as presented here, is actually the basis of two distinct yet closely related projects. The talking clock is a dedicated application of speech synthesis while the Babbler is a generalized speech synthesizer. Your selection of the speech processor chips will determine the actual results.

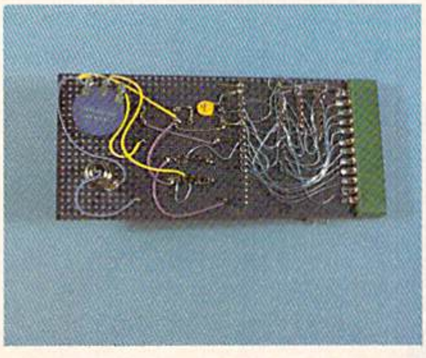
This project was originally based on the General Instrument SPO256 Speech Processor and its associated SPR16 custom ROM. This chip set was sold by Radio Shack as catalog number 276-1783 for $12.95 and may still be available in many stores. The SPO256 has a small built-in vocabulary consisting of the digits 0-9. The SPR16 expands this vocabulary to 32 phrases which are suitable for a talking clock.

The SPO256 and the SPR16 were subsequently replaced by the SPO256-AL2 as stock number 276-184, which is being sold at the same price. The new chip has a built-in ROM which contains 64 phonemes, the fundamental components of speech. Thus the SPO256-AL2 has an unlimited vocabulary and it no longer requires the use of the external ROM. This Speech Processor chip is actually the same one used in the Welwyn Currah Voice Messenger. The difference between the Voice Messenger and the Babbler is that the former also includes its own eight-kilobyte operating system and text-to-speech translator on ROM. You will have to program the Babbler yourself by combining allophones into the appropriate strings. This speech code will be stored in your computer as part of your application program.

Since the circuit of the *Ahoy!* Babbler is the same for either chip and many Radio Shack stores still have both chips in stock, we are presenting the specialized Talking Clock as well as the more generalized *Ahoy!* Babbler speech synthesizer. The circuit was designed to work with the VIC 20, the C-64, and the C-128 with only some minor software changes.



The basic circuits for the Babbler and the Talking Clock are identical.



A bottom view of the Babbler prototype shows its wire wrap construction.

The same program will work with both the C-64 and the C-128, since the I/O chips reside at the same memory locations for both computers. The VIC 20 I/O locations are different, which requires a modification of the code. It should be possible to easily modify the project for the Plus/4 as well.

The basic circuits for the *Ahoy!* Babbler and the Talking Clock are identical. The only difference is that the clock has an extra socket for the SPR16 custom ROM. Since the Babbler does not require the external ROM chip, you may leave out its socket labeled U2 on the drawings.

Two programs are presented on pages 118-119. The *Talking Clock* program is for use only with the SPO256/SPR16 ROM chip set. When you are typing in this program, be sure to pay attention to the REM statements for your computer. The listing shown is for the VIC 20. The lines for the C-64/C-128 are REMed out. (The Bug Repellent line codes to the right of each program line are, however, for the C-64.)

The short program for the *Ahoy!* Babbler (see VIC 20 and C-64/C-128 versions on page 119) demonstrates the basic combination of phonemes into words. An interesting first project would be setting up the vocabulary to implement the Talking Clock using the Babbler circuits. If you study the code and the accompanying sample programs for the *Ahoy!* Babbler, you should be able to convert the clock program to work with the SPO256-AL2. This should not be difficult, since the data sheets that accompany the SPO256-AL2 include a dictionary

which contains the required words. The only thing you may not be able to reproduce are the various clock chimes which are generated by the Talking Clock. Table 2 is a complete list of the allophones for the SPO256-AL2 Speech Processor.

HOW IT WORKS

To voice a specific word or allophone, its address is placed on address lines A1-A8. This will be a value of 0-35 for the Talking Clock or 0-64 for the Babbler. A negative pulse from the computer on the ALD (pin 20) loads the eight address bits into the synthesizer input port. At this point a sequence of allophone data, from the external or internal ROM, is serially clocked into the synthesizer. The selected word is then sounded. Handshaking capability is provided through the Load Request line (LRQ) (pin 9). When the LRQ goes to a logic 0, address data is strobed into the synthesizer's input port. A logic 1 on the LRQ indicates that the input buffer is full and a word is being sounded. Even in the world of Micro Technology, it is rude to interrupt someone when he is talking.

A pulse width modulated digital signal is transmitted out of the synthesizer chip on pin 24. Conversion to an analog audio signal is accomplished by a 5Khz external filter.

THE TALKING CLOCK PROGRAM

The TI$ string variable, in Commodore BASIC, performs the function of an internal, real time 24 hour clock, which is updated at the rate of one count every second. This clock counts up to 235959 and then resets to 000000. TI$ can be set in either direct mode or under program control.

When RUN, the program prompts you for the current time in HHMMSS format. Enter the time of day based on a 24-hour clock. For example, 2 p.m. will be 140000. As you are typing in the time, the hours, minutes, and seconds will align under their respective letters. If you enter the time incorrectly, i.e., too many characters or an invalid number, the program will reset the screen and allow you to reenter the time. Once you have successfully entered the time, the computer will announce the time and continue to announce the time at the top of every minute.

The TI$ variable is analyzed to acquire the Hour "A" and the Minutes "B". The hours are evaluated for anything greater than 20 by lines 270-290. The minutes are also evaluated in the same manner as the hours, but in this case values of 20 through 50 are checked. The reasoning for the elaborate checking, for both the hours and minutes, will become evident when you realize that addresses greater than 20 on the SPO256 will not give you the corresponding voiced output. If you look at Table 1, you will notice that inputting a 25 into the synthesizer will not give you the number "twenty-five" sounded out. Instead, the phrase "A.M." will be voiced. In order for the number "twenty-five" to be voiced, it must first be broken into two corresponding addresses. The first address is 20, which corresponds to the voiced "twenty." The following address would be 5, which corresponds to the number "five" being voiced.

As an example, line 390 checks for the minutes being greater than 40. The value 40 is subtracted from the actual minutes value. B1 now contains the units of minute value and the value B is replaced with the proper address (22) in order to voice the word "forty."

TABLE 1 – VOCABULARY LIST FOR SPO256 (TALKING CLOCK)

Address	Word	Address	Word
0	Oh	18	Eighteen
1	One	19	Nineteen
2	Two	20	Twenty
3	Three	21	Thirty
4	Four	22	Forty
5	Five	23	Fifty
6	Six	24	It Is
7	Seven	25	A.M.
8	Eight	26	P.M.
9	Nine	27	Hour
10	Ten	28	Minute
11	Eleven	29	Hundred Hour
12	Twelve	30	Good Morning
13	Thirteen	31	Attention Please
14	Fourteen	32	Please Hurry
15	Fifteen	33	Melody A
16	Sixteen	34	Melody B
17	Seventeen	35	Melody C

PARTS LIST

U1	SPO256	Speech Processor	Radio Shack 276-1783
U2	SPR016	Serial Speech ROM	P/O RS 276-1783
U1	SPO256	Speech Processor (alternate)	Radio Shack 276-1784
U3	LM386	Audio Op Amp	Radio Shack 276-1731
XTAL	3.579MHz	TV Colorburst Crystal	Radio Shack 272-1310
R1,2	33K,¼W	Resistor	Radio Shack 271-1341
R3	10K	Variable Resistor	Radio Shack 271-1721
R4	10 OHM,¼W	Resistor	Radio Shack 271-001
C1,2	.002 mf	Capacitor, Disc	Radio Shack 272-1066
C3,10	10 mf	Capacitor, Electolytic 35VDC	Radio Shack 272-1014
C4	10 mf	Capacitor, Electrolytic 35VDC	Radio Shack 272-1013
C5,6	.1 mf	Capacitor, Disc 50VDC	Radio Shack 272-135
C7	100 mf	Capacitor, Electrolytic 35VDC	Radio Shack 272-1016
C8,9	47 pf	Capacitor, Disc 50VDC	Radio Shack 272-121
J1		44 Pin Card Edge Socket	Radio Shack 276-1551
J2		Shielded Phono Jack	Radio Shack 274-346
		Multi-purpose Plug-in Board	Radio Shack 276-152
		or	
		Grid Board	Radio Shack 276-158
		8 Pin Dip Socket	Radio Shack 276-1995
		16 Pin Dip Socket	Radio Shack 276-1998
		28 Pin Dip Socket	Radio Shack 276-1997

The format, or sequence, on how the line is voiced is stored in the array labeled SP(x). SP(1)=31 addresses the phrase "Attention Please," while SP(2)=24 addresses the phrase "IT IS." The subsequent values in the SP array contain the hours and minutes value as decoded in lines 270-420.

Three Sound Format routines are incorporated to handle the

1) Top of the Hour
2) Units of Minutes
3) Tens of Minutes

Line 2000 is aptly labeled SPEAK! In this section the array SP is accessed and sent out as successive addresses to the synthesizer. Handshaking is checked by line 2020:

```
IF PEEK(DRT)>127 GOTO 2020
```

(for the VIC 20). The computer checks to see if the synthesizer is ready for another address. The time is enunciated at the top of every minute. Lines 2050-2090 check for the top of the minute.

The I/O setup (lines 130-160) initializes the user port so that all bits, except the most significant bit, are outputs. This is accomplished by POKE DDR, 127. The output strobe is done via CB2 by the instructions A=PEEK(37148) AND 15:POKE 37148,160 OR A (for the VIC 20).

As mentioned previously, the time is enunciated every minute. To have the time enunciated whenever you hit any one of the keys, remove lines 2060-2080 and insert the following:

```
2060 GET A$:IFA$="" THEN 2
060
2070 GOTO 200
```

To change the melody at the top of the hour to another phrase, or melody, select the appropriate address from Table 1 and insert it into SP(5) in line 1010 and SP(6) in line 1020.

TABLE 2 — SPO256-AL2 ALLOPHONE ADDRESSES

Decimal Address	Allo-phone	Sample Word	Duration	Decimal Address	Allo-phone	Sample Word	Duration
0	PA1	PAUSE	10MS	32	/AW/	Out	370MS
1	PA2	PAUSE	30MS	33	/DD2/	Do	160MS
2	PA3	PAUSE	50MS	34	/GG3/	Wig	140MS
3	PA4	PAUSE	100MS	35	/VV/	Vest	190MS
4	PA5	PAUSE	200MS	36	/GG1/	Got	80MS
5	/OY/	Boy	420MS	37	/SH/	Ship	160MS
6	/AY/	Sky	260MS	38	/ZH/	Azure	190MS
7	/EH/	End	70MS	39	/RR2/	Brain	120MS
8	/KK3/	Comb	120MS	40	/FF/	Food	150MS
9	/PP/	Pow	210MS	41	/KK2/	Sky	190MS
10	/JH/	Dodge	140MS	42	/KK1/	Can't	160MS
11	/NN1/	Thin	140MS	43	/ZZ/	Zoo	210MS
12	/IH/	Sit	70MS	44	/NG/	Anchor	220MS
13	/TT2/	To	140MS	45	/LL/	Lake	110MS
14	/RR1/	Rural	170MS	46	/WW/	Wool	180MS
15	/AX/	Succeed	70MS	47	/XR/	Repair	360MS
16	/MM/	Milk	180MS	48	/WH/	Whig	200MS
17	/TT1/	Part	100MS	49	/YY1/	Yes	130MS
18	/DH1/	They	290MS	50	/CH/	Church	190MS
19	/IY/	See	250MS	51	/ER1/	Fir	300MS
20	/EY/	Beige	280MS	52	/ER2/	Fir	300MS
21	/DD1/	Could	70MS	53	/OW/	Beau	240MS
22	/UW1/	To	100MS	54	/DH2/	They	240MS
23	/AO/	Aught	100MS	55	/SS/	Vest	90MS
24	/AA/	Hot	100MS	56	/NN2/	No	190MS
25	/YY2/	Yes	180MS	57	/HH2/	Hoe	180MS
26	/AE/	Hat	120MS	58	/OR/	Store	330MS
27	/HH1/	He	130MS	59	/AR/	Alarm	290MS
28	/BB1/	Business	80MS	60	/YR/	Clear	350MS
29	/TH/	Thin	180MS	61	/GG2/	Guest	40MS
30	/UH/	Book	100MS	62	/EL/	Saddle	190MS
31	/UW2/	Food	260MS	63	/BB2/	Business	50MS

CIRCUIT DESCRIPTION

The circuit (Figure 2) is based on the Radio Shack data sheet. The synthesizer chip U1, after being loaded with the 8-bit address (0-35 for the SPO256, 0-64 for the SPO256-AL2) produces a pulse modulated digital output (pin 24). C1, C2, R1, and R2

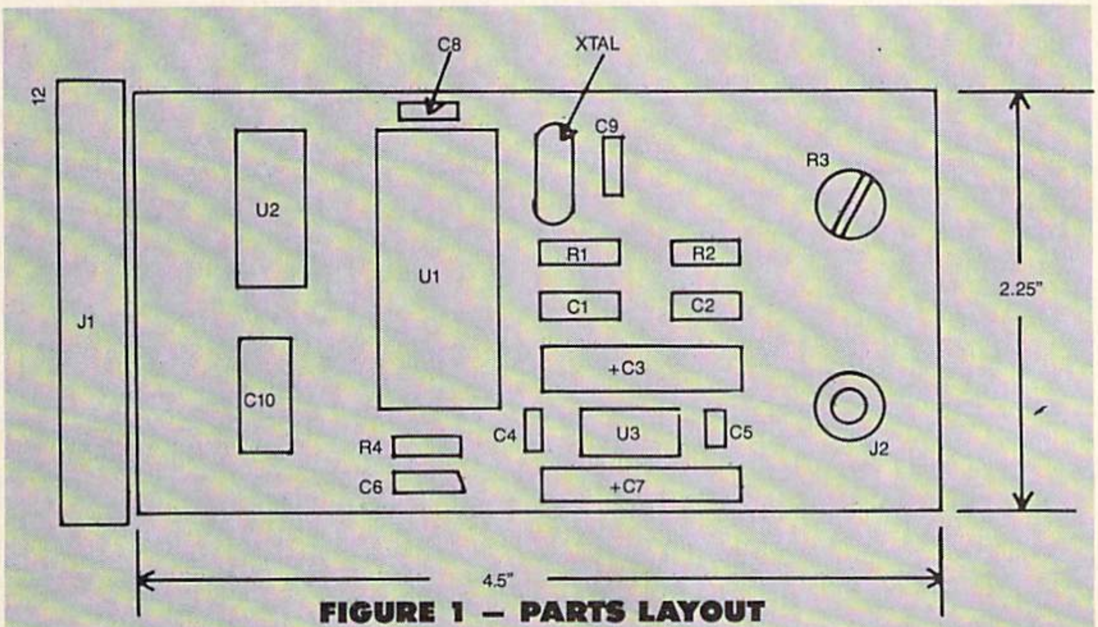


FIGURE 1 — PARTS LAYOUT

A standard piece of perforated 100th inch center board was used for circuit board. Layout and wiring techniques are not critical. Wire wrap sockets were used (the fastest way to get the circuit running).

form a 5KHz low pass filter. U3 is an audio amplifier with a gain of 200, whose output volume is controlled by R3 (10K potentiometer). For lower output gain, the 10mf capacitor (C4), can be removed. A standard 8-ohm speaker is used for the output. Note that the SPR016 ROM chip (U2) may be omitted if you are using the SPO256-AL2.

CONSTRUCTION

The circuit board layout is shown in Figure 1. A standard piece of perforated 100th inch center board was used. Layout and wiring techniques are not critical. Wirewrap sockets were used since it was the fastest way to get the circuit up and running. Although the applications in the data sheet called for a 3.12MHz crystal, a standard 3.579MHz T.V. color burst crystal, available at Radio Shack, can be used with excellent results.

In construction, a 12-pin edge connector was used, butted up against the perforated board edge. To secure the edge connector to the board, a small piece of wire (use the remains of one of the component leads) should be run through pins 1 and 12 of the edge connector. Solder pins A to 1, and 12 to M.

Caution: Do not do this to any other pins. A, 1 and 12, M are the only pin sets that are common on either side of the I/O connector.

An alternate method of assembling the connector is to acquire a 44-pin plated finger perforated board, cut it down to size (24 pins), and solder the edge connector directly to the fingers of the board. If you cannot find a 24-pin edge connector, use a 44-pin connector, sold at Radio Shack, and cut it down to 24 pins. Wire the edge connector on your perforated board so that it corresponds with the layout in Figure 2.

IN CLOSING

Advanced users will recognize the possibility of creating a real time talking clock using machine language. This will require the use of the microprocessor's interrupt capabilities. Properly implemented, .this clock would run in the background without interfering with your BASIC programs. This is a possible topic for a future article. ☐

SEE PROGRAM LISTINGS ON PAGE 118

SMALL THINGS CONSIDERED

Ahoy! is pleased to congratulate

Frank Bellantoni (Brooklyn, NY)
Debra Gardner (New York, NY)

winners of subscriptions to *Ahoy!* courtesy of New York's *Small Things Considered* radio show (heard weeknights 5-8 and Saturdays 6-8 on WNYC AM83).

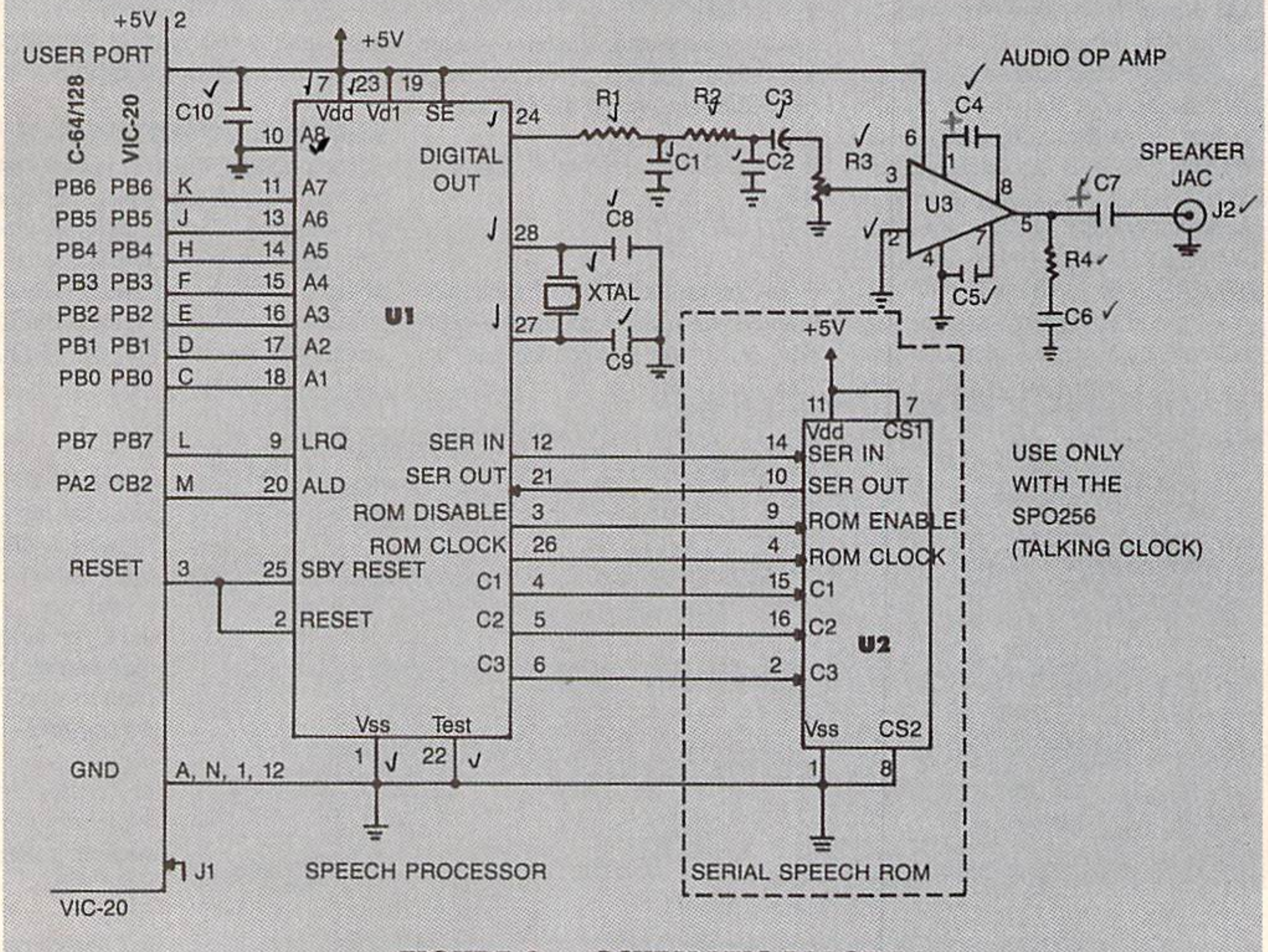
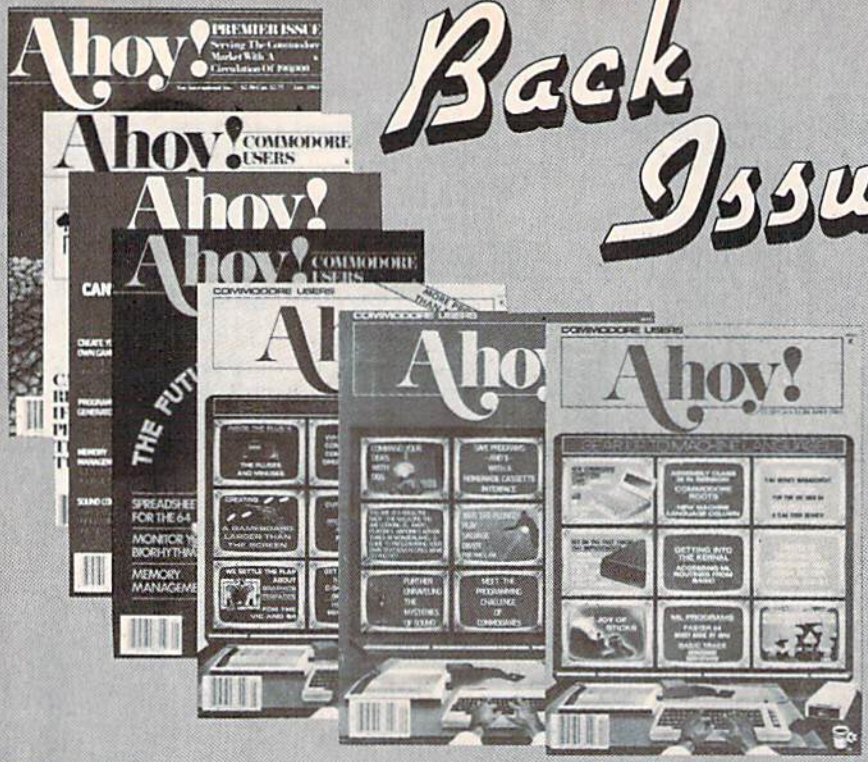


FIGURE 2 — SCHEMATIC DIAGRAM

Reader Service No. 110



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ERRATA

RHYTHMIC BITS (Nov. '85)

The machine language portion of *Rhythmic Bits* did not appear in the magazine. Using *Flankspeed*, type in the ML portion as listed here and save it to disk. To use *Rhythmic Bits*, LOAD"ML PORTION",8,1 and then load in the BASIC portion from the November issue and run it.

RHYTHMIC BITS ML

Starting address in hex: C000
Ending address in hex: C0B7

```
C000: 01 02 04 08 10 20 40 80 FF
C008: 00 07 0E 00 FF FF 00 00 1D
C010: 00 04 08 0C 10 14 18 1C 80
C018: A6 FD BD 08 C0 85 FE A6 6E
C020: FC BD 10 C0 85 19 EA BD F2
C028: 00 C1 A6 FE 9D 00 D4 A6 A8
C030: 19 BD 01 C1 A6 FE 9D 01 0E
C038: D4 A6 19 BD 02 C1 A6 FE F3
C040: 9D 06 D4 A6 19 BD 03 C1 FA
C048: A6 FE 85 19 E6 19 A5 19 4B
C050: 9D 04 D4 C6 19 A5 19 9D 03
C058: 04 D4 60 EA EA EA EA EA 28
C060: EA A6 FC BD 00 C0 25 FB 8E
C068: 60 EA EA EA A9 00 85 FC B5
C070: 85 FD 85 FE 20 61 C0 F0 AB
C078: 0B 20 18 C0 E6 FD A5 FD 05
C080: C9 03 F0 08 E6 FC A5 FC CC
C088: C9 08 D0 E8 60 EA EA EA 35
C090: A5 19 A2 00 E8 D0 FD EA 94
C098: EA C6 19 D0 F5 60 00 00 8A
C0A0: A0 00 B9 00 C2 85 FB AD EC
C0A8: 0C C0 85 19 20 90 C0 20 A5
C0B0: 6C C0 C8 C0 20 D0 EB 60 A4
```

LIGHTNING LOADER (Nov. '85)

Several readers reported an OUT OF MEMORY error in *Lightning Loader*. To remedy this problem type NEW and hit RETURN after loading in *Lightning Loader*.

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11. I certify that the statements made by me above are correct and complete.
Daniel Tunick, Controller

MEMORY CHECK

For the C-64

By Buck Childress

Don't you sometimes wonder if Old Reliable has a touch of amnesia? Will it remember all those goodies you just packed into its RAM?

Lots of things can happen to arouse your suspicions. Maybe a command won't execute the way you expect it to, or the C-64 keeps crashing like a DC-10. Heck, who wants to admit they goofed? But, when all is said and done, it's almost always a user error (oh, the pain of it). Still, with that much free RAM, isn't it possible that some memory might have vanished?

After another rousing argument with my computer over which one of us caused the latest disintegration of a masterpiece, I decided to write a program which would prove once and for all that I was right and my C-64 was wrong. After all, my dignity was at stake. So, in a gallant quest for truth, *Memory Check* was born.

Memory Check will test every one of the 38911 BASIC memory locations in your C-64. It works by attempting to store all values from 0 to 255 in each location, beginning at 2048 (start of BASIC RAM). If all's well here, *Memory Check* moves to 2049 and the process is repeated. This continues through 40959 (end of BASIC RAM).

While *Memory Check* is running, you'll see what appears to be a shimmering object. This is a video display of the values being stored in each memory location. The object appears to be shimmering because of the tremendous speed of machine language. The current location being tested is also displayed. Should a bad area be encountered, the screen border will turn red and the display will let you know where the problem is. If everything checks out the screen border will turn green and the display will verify that the last test was at 40959.

Since the computer must store and display values almost ten million times (38911 locations * 256 values), while making comparisons in between, it was necessary to program *Memory Check* in ML. It only takes a few minutes to complete its task, as opposed to many hours if it were programmed in BASIC.

After you've entered *Memory Check*, save it before doing anything else. You can then run it and follow the prompt.

By the way, my 64's RAM checked out fine. It must be something else. After all, it couldn't be me, could it?!

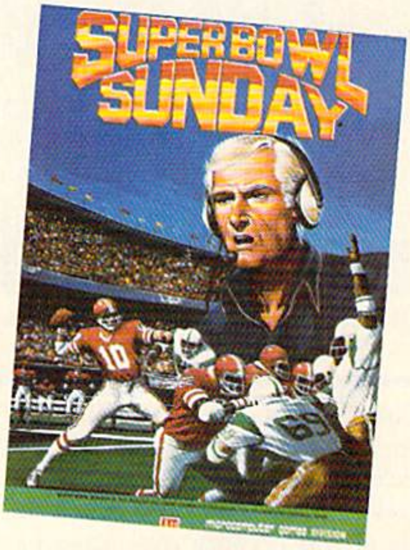
I hope *Memory Check* becomes a useful addition to your software library. □

SEE PROGRAM LISTING ON PAGE 137

CALLING COMPUTER COACHES

Team Sports Simulations for the Commodore 64

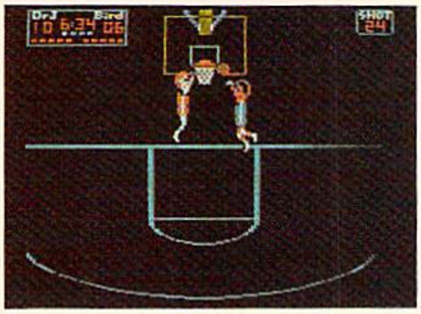
By Bill Kunkel and Arnie Katz

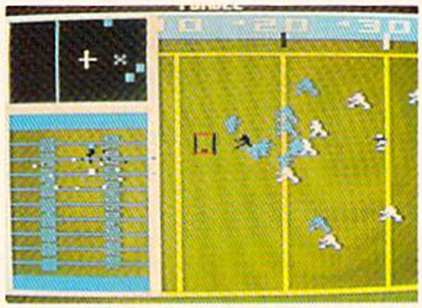


Direct one of twenty classic teams.
READER SERVICE NO. 241

After breakfast, I spent a cool million on a professional football squad. Then, I blasted a few pucks past a top goalie, drafted players for my major league baseball team, and shot some hoops with Larry Bird.

All in all, it was a most enjoyable morning. How fortunate to own a Commodore computer during the Golden Age of C-64 sports games! Excellent programs are available which simulate every major team sport, and there's frequently a choice among action, strategy, and statistical replay contests.





Jump with **Bird and Erving;** *bump with* **The World's Greatest Football Game.**
READER SERVICE NO. 242 *READER SERVICE NO. 243*

The Whole Hundred Yards

Football is the major popular computer sport in Commodore country with six titles. Designers have tried a wide range of approaches to transferring the strategic and kinetic thrills of the gridiron to the gaming screen, so there's a pigskin program for just about every taste.

All football games incorporate at least some strategy. Football without set plays and precise formations would be a melee between two uniformed mobs of fitness freaks. A game which completely ignored the sport's more cerebral aspects wouldn't be much of a simulation.

An action-oriented football game, like *On-Field Football* (Gamestar), subordinates planning to execution. The strategic elements serve to set up the action.

Artificial intelligence makes the onscreen athletes more than simple human-shaped cursors. Coaches customize their offensive squads by selecting a quarterback, tight end, and wide receiver from a pool of available talent. Each of the candidates has a different balance of skills. A particular quarterback may heave the ball 60 yards but lack mobility, while the alternative is a scrambler with a weak but accurate arm. These strengths and weaknesses subtly fashion the team's personality.

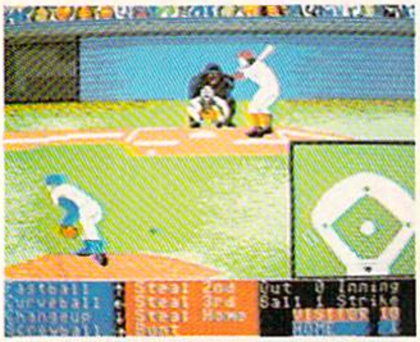
The coach of the team with the ball picks a formation and play-routes with the joystick, which also controls the action after the ball is snapped. The defense, also employing a joystick, chooses one of the four line setups and selects pass coverage for the secondary.

Two additional options sharpen the strategic focus. The offensive team can cross up the defenders by substituting an "audible" at the line of scrimmage for the original play, and teams can insert substitutes late in the game.

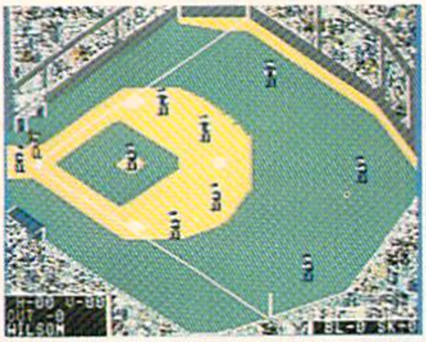
The visual presentation of *On-Field Football* is highly unusual. The gridiron scrolls vertically as posession moves between the goal lines, while most other programs favor the traditional horizontal playfield. The players are well-drawn and correctly sized for the playing area. *On-Field Football* gives teams room to maneuver so that the game doesn't become an endless series of desperation passes.

No one will ever confuse the free-wheeling hijinks of a typical game of *On-Field Football* with the National Football League. This is sandlot football with four men on a side and razzle-dazzle plays which often mystify the team with the ball as much as they do the defense. Would-be Tom Landrys may find *On-Field Football* a little too frivolous, but it's truly an action-gamer's delight.

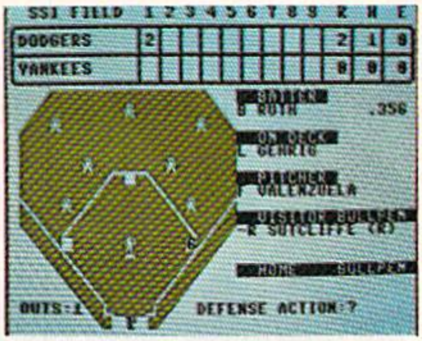
Strategy football games sacrifice



Hardball *has TV camera perspectives.*
READER SERVICE NO. 244



World's Greatest Baseball Game: *slow.*
READER SERVICE 245



Computer Baseball: *replay seasons.*
READER SERVICE NO. 246

direct control of the onscreen action for greater latitude in offensive and defensive play-making. Thus they are less a test of motor skills than a battle of wits between rival planners.

Computer Football Strategy (The Avalon Hill Game Company) was the first program of its type for the Commodore and still rates as a thought-provoking sports simulation. *Computer Football Strategy* is a one- or two-player contest based on AH's long-popular non-electronic boardgame of the same name.

Basically, it's a poker game between offense and defense. Each coach picks a play from an extensive list of possibilities. The computer cross-indexes these selections and shows the result of the play in colorful animation.

Computer Quarterback (Strategic Simulations) limits the graphics to the x's and o'x of the coach's chalkboard, but adds a new dimension to the strategizing: variation in the abilities of the players.

Before the opening kickoff, each coach uses a bankroll of $3 million to build a dream team. The amount spent on players in each of the 12 categories (split end, tight end, wide receiver, fullback, halfback, quarterback, offensive line, defensive line, linebackers, deep backs, special teams, and kicker) determines the quality of the gridders the team acquires.

The coach/general manager can create any type of squad by spending more on some positions and less on others. Allocating heavy bread for a quarterback and the receivers produces a passing attack to rival the Miami Dolphins, while spending the same amount on a halfback, fullback, and offensive line can generate a crunching running game. SSI has disks with statistically computed models of actual professional football players for those who like the idea of directing teams bristling with familiar names.

The World's Greatest Football Game (Epyx) is a detailed simulation of football coaching which frees gridiron gurus from the shackles of preset plays. The computerist creates the offense and defense from scratch using a simple electronic chalkboard system. In effect, each gamer can design a complete playbook and save it to disk for use in actual games.

The outcome of all this planning can be displayed on the screen at a variety of user-selectable speeds. Plays may be rerun and examined in microscopic detail; there's even an option allowing frame-by-frame advance.

Statistical replay games are strategy-oriented programs which up the emotional ante by putting analogs of actual players on the field. Such contests are built on extremely detailed mathematical models designed to reflect real-world performance. In essence, a player in a stat-replay program will have about the same degree of success as his flesh-and-blood counterpart.

Stat replay is probably the most precise way to reproduce the dynamics of actual sports on the computer screen. In pure strategy games, the coaches call offensive and defensive plays in an ideal environment, but stat-replay coaches must also consider the abilities of the athletes who carry out their orders. An outside sweep, therefore, has a much greater chance of success if the ball is in the custody of the elusive Marcus Allen than if the lumbering Pete Johnson is toting the pigskin. Of course, the talents of the offensive line and the individual defenders also have a bearing on the result.

Stat replay games never wear out. Just feed them a new set of statistics, and it's a brand new game. Publishers of such software traditionally issue a "team disk" which reflects player performance during the previous season.

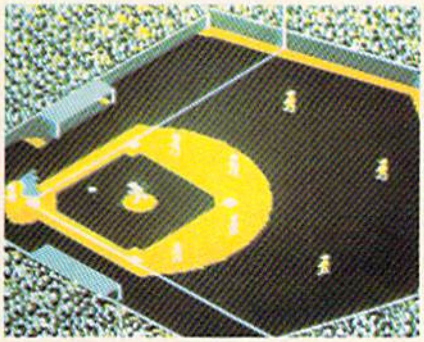
For most gamers, the best stat replay program is probably *Super Bowl Sunday* (The Avalon Hill Game Co.). Computerists can direct one of 20 classic Super Bowl squads against another human coach or the computer.

The offensive coach picks the formation (pro set, three-back, or four-receiver), selects a play, and assigns players to carry it out. The defense then enters its play-orders, including blitzes and double-coverage of key receivers. Well-designed menu screens make this process remarkably easy.

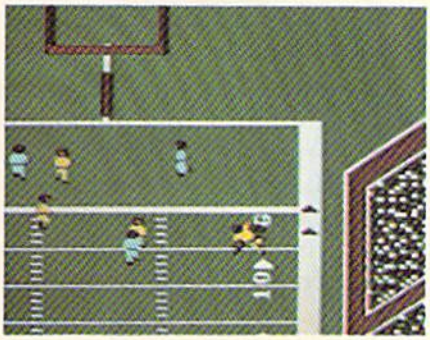
Once both teams are ready, full-screen animated graphics show the result of the play. Although the figures are not overly detailed, the lifelike animation captures the spirit of blocking and tackling.

Avalon Hill has already produced a team disk based on the 1984-1985 season. Additional disks featuring classic teams from the pre-Super Bowl era are a definite possibility.

Three-in-One Football (Lance Haffner Games) is a no-frills product from a small company which should greatly please dedicated stat replay fans. This all-text program features both pro and



Star League Baseball: *full-field view.*
READER SERVICE NO. 247



On-Field Football *is action-oriented.*
READER SERVICE NO. 248

college teams, and Haffner Games offers literally hundreds of different squads, including the USFL.

Ironically, *Three-in-One Football* requires less knowledge of individual players than other stat games. The computerist calls the play, and the program automatically picks the appropriate ball carrier or pass catcher. The simulation is extraordinarily detailed, and *Three-in-One Football* may well be the most precise recreation of big-time gridiron action.

Diamond Disks

The National Pastime is also well-represented in the C-64 universe. In addition to a pair of classic action contests, there are no fewer than four statistical simulations.

The newest kid on the block is *Hardball* (Accolade), a high-resolution action-strategy game with TV camera perspectives. This contest concentrates on the battle between pitcher and batter as viewed by sports television's celebrated "centerfield camera" angle. If the batter hits the ball, the appropriate fielder takes center-screen. A small overhead view of the whole diamond gives managers a sense of the big picture.

Star League Baseball (Gamestar) takes a more well-rounded approach to Abner Doubleday's creation. By keeping the entire field always in view, *Star League* draws computerists' attention to the team aspects of the sport.

The use of artificial intelligence, characteristic of Gamestar software, allows each manager to customize some aspects of his or her team. The hitters can aim for the fences or pound out liners, and the pitcher can throw smoke or finesse the opposition with curveballs. There's even an opportunity to bring in a reliever in the late innings.

But *Star League* is fundamentally a contest of timing and reflexes. The defense selects pitches and maneuvers fielders, and the offense controls everything from the batter's swing to the baserunning.

Even after several years on the market, *Star League Baseball* is still Hall of Fame arcade-style fun. It plays well, and it looks great.

Micro League Baseball (Micro League Sports Association), on the other hand, is meat and drink for stat replay lovers. Though its graphics equal those of any action program, it also accurately replicates the performance of major league players.

Micro League Baseball comes with 19 classic teams, all-time great Phillie and Tiger squads, two teams of old-time superstars, and the 1984 All Star teams. Additional team disks, including one which allows managers to trade players and draft leagues, are available for separate purchase.

Although the program features a fairly effective computerized opponent, Micro League is even more fun as a head-to-head competition. The skipper of the team at bat decides whether the hitter should swing away, hit and run, or bunt, and also controls the aggressiveness of baserunners. The opposing pilot selects the type of pitch and positions the infielders in crucial situations.

Every nuance is displayed in color animation. The onscreen athletes seem almost alive as they whip the ball around the diamond after a strikeout or trot to the dugout between innings.

Computer Baseball (Strategic Simulations) isn't quite as pretty as *Micro League Baseball,* but it may be better for those who replay entire seasons, a popular pursuit among stat-oriented gamers. Its graphics are minimal, little more than a schematic to track runners on base, but its mathematical model considers more statistical categories than other programs.

Because *Computer Baseball* has been on the market for several years, the publisher has had time to produce a large library of supplemental disks. These include both selections of great teams of the past and full seasons.

Statis-Pro Baseball (The Avalon Hill Game Co.) also favors numbers over pictures. Because it's based on a non-electronic baseball game, the computer version benefits from about a decade of fine-tuning. *Statis-Pro* is visually primitive, but its play-mechanic is exceptionally smooth and simple to learn.

Avalon Hill has recently released a supplementary disk for *Statis-Pro Baseball* which reproduces the 1984 major league season. Several past years are also available from the publisher.

Those who want the versatility of a program which features both strategy and action should check out *The World's Greatest Baseball Game* (Epyx). The program, designed by Quest, offers both statistical-replay and arcade-action modes.

Graphics include a full-field display and an outfield scoreboard with inning-by-inning breakdowns and the lineup of the team at bat. The animation is a little slow in the action version, but is quite suitable for the stat-replay mode.

Sports Far Afield

Baseball and football aren't the only team sports which have been turned into computer simulations for the Commodore 64. *International Soccer* (Commodore/cartridge) is a pure action game, but, oh, what action!

The player uses a joystick to control the ball carrier, who can pass,

dribble, and shoot. On defense, the highlighted athlete is under the computerist's control. When action nears one of the goals, control automatically shifts to the netminder.

International Soccer is played on a beautiful, horizontally scrolling field canted at a three-quarters angle. The onscreen players are large and well-articulated, and they respond well to the joystick. The program also includes a nice extra: the winning team is presented with a loving cup at center field.

Ice hockey aficionados, meanwhile, may wish to take a skate with *International Hockey* (Advantage Artworx). This is a first-class revamp of Artworx's *Slap Shot.* As in the earlier program, action scrolls horizontally, and the coach controls the puck carrier (or the nearest defender) with the joystick. The skaters can pass, rush, shoot, or even body check. But if they get too boisterous, watch out for penalties.

International Hockey provides the solitaire play option missing from *Slap Shot.* The new design also boasts limited speech synthesis and "penalty shots," a secondary mode in which a puck is shot directly at the goal, seen from a head-on perspective.

The graphics and play, while not the ultimate in sophistication, should be quite acceptable to hockey-starved computerists. Artworx has taken a solid program and made it truly excellent.

There are no team basketball simulations, but there is *Larry Bird and Julius Erving Go One-on-One* (Electronic Arts). Fluid animation and artificial intelligence which mimics the players' signature court moves make this one a must-have.

One of two gamers direct computerized replicas of Bird or the Doctor with the joystick. Whether or not the ball goes into the hoop depends on where on the court the player shoots and how well the defender is guarding.

Basketball purists will certainly miss key aspects of the sport such as passing and set plays, but *One-on-One* gives a fair approximation of what might take place if these two all stars met on a playground for a little head-to-head rivalry.

On the Farm

The already extensive selection of team sports simulations will expand even further in coming months. Lance Haffner Games will soon produce its stat replay basketball program for the Commodore 64, Gamestar reports it is preparing a basketball title, and Micro League Sports Association intends to publish a football simulation to go with its popular baseball program. And there will be, as usual, several unpreviewed sports simulations, too.

Play ball! ☐

ALICE IN VIDEOLAND

Artworx
Commodore 64
Disk; $19.95

Alice has fallen down a rabbit hole, into a spectacular world of mad queens, white rabbits, Cheshire cats, and other characters created by Lewis Carroll. Alice's adventures have inspired John Fitzpatrick to design four linked action games which transport joystick-jockeys to the heart of this wonderland. This all-family entertainment is simple enough for even a fumble-fingered parent, yet charming enough to hold a child's attention.

Alice begins her trek in a lovely park. Clouds drift over a tree-lined landscape, and birds fly through the sky as a white rabbit hops across the lawn. When the bunny jumps into its hole, Alice follows.

The first test chronicles her plunge through the rabbit warren. Using a joystick, the gamer moves Alice back and forth and attempts to catch useful objects as she tumbles past them. There are bottles of make-me-small liquor, slices of make-me-grow cake, and keys which fit doors in the next room. Alice needs as many as she can capture for the second round of play, but she can only hold one object at a time unless she snags one of the wicker baskets. If the heroine bumps into any of the wall sconces as she falls through the room, she drops everything and must start collecting goodies again.

When Alice finally hits the floor, she has to search for doors. These color-coded portals only open with the captured keys, and Alice can enter only if she's the right size. The cakes and bottles let her adjust her height. Each of these rooms contains more drifting objects and more doors to open if she can.

Not everything that flies past is helpful. If Alice is hit by the rabbit's fan, it makes her too big for any door. If a clock hits Alice, time runs out.

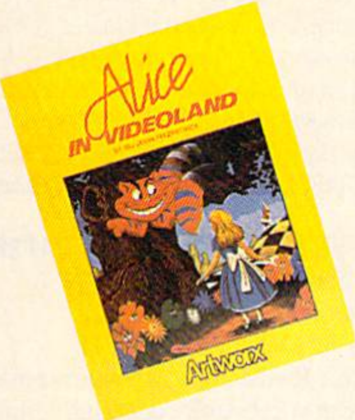
Next, Alice explores a lovely garden in a jumping game. While the caterpillar smokes his hookah atop a giant mushroom and the Cheshire Cat smiles down from his treetop perch, Alice tries to capture butterflies as they flit past. Each one is worth 10 points. A winged rocking horse worth 100 points flies past periodically. When Alice captures this tiny Pegasus and hops back down to the ground, the horse turns into a ball and rolls away, to reappear in a later contest.

If Alice is struck by a seed from a germinating flower, she shrinks to such a small size that further jumping becomes impossible. Eating one of the small fungi that rings the caterpillar's giant mushroom restores her size so she can continue the contest. When the girl has devoured all of the little mushrooms, the scene changes again.

The third game echoes the chess theme of Carroll's masterpiece. Alice has to make her way across a chessboard, avoiding the Jabberwocky and Tweedledum and Tweedledee. She has two white knights to run interference, but Jabberwocky and the fat twins are formidable opponents. It's worth 1,000 points to get Alice all the way across the board, but it takes careful strategy to gain that goal.

The final game parodies the croquet contest between Alice and the Queen of Hearts. When the round begins, Alice has one ball plus any orbs won in the garden scene. If Alice can maneuver the croquet ball into one of the two hoops formed by the playing-card soldiers, she earns 500 points plus another ball. But if the Queen captures the ball, she stomps it flat.

This is a game of angles. Alice must bounce the croquet ball against the bushes and fence to make it scoot through the hoop.



Alice *consists of four linked games.*
READER SERVICE NO. 249

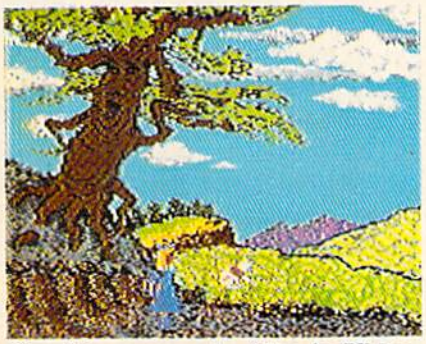


Alice's *uncomplicated play-mechanic is hardly innovative. The first contest is reminiscent of early videogames; the second, though stunning, is straightforward. The third game is the most unusual.*

Alice in Videoland is not difficult at its beginning level, but it can challenge even skilled gamers at its upper settings.

Still, the uncomplicated play-mechanic could hardly be called innovative or original. The first contest is reminiscent of early videogames; all the computerist has to do is maneuver Alice around the screen to catch desirable objects while avoiding obstacles. The second screen, despite its stunning graphics, is a straightforward jump-and-grab game. The chess match against Jabberwocky and his twin helpers, a challenge for strategists, is the most unusual of the quartet, although it is less visually striking. The croquet contest just takes some practice.

Alice in Videoland partially overcomes its relative simplicity with superior presentation. The animated title page, with hopping rabbit and flying birds, is strikingly beautiful. The garden scene also boasts outstanding visuals. Although the other screens aren't as dramatic, they are quite attractive, and their good looks go a long way toward making the game fun to play. *Alice in Videoland* has little to test the skill of action aces, but casual players will probably enjoy the total experience fairly well.



Graphics screens in Alice in Videoland *range from attractive to striking.*

Artworx, 150 North Main St., Fairport, NY 14450 (phone: 716-425-2833). *—Joyce Worley*

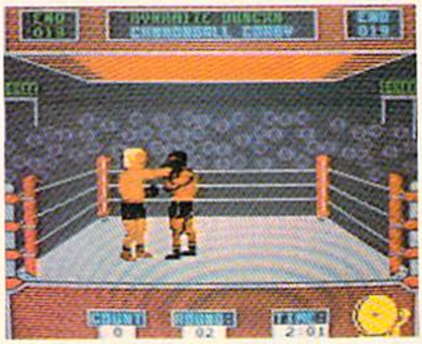
STAR RANK BOXING
Gamestar
Commodore 64
Disk; $29.95

The most exciting fights since *Rocky III* are taking place on the Commodore computer, thanks to the efforts of designer Troy Lyndon. Once again, Gamestar proves it has the courage to tackle a supposedly overused subject and the talent to produce a strikingly original program. Activision published the first piece of fistic software in 1980, and there have been at least a half-dozen more games since, but *Star Rank Boxing* looks like the new champion.

Star Rank Boxing breaks new ground by relating individual matches to the fighter's overall career. Other boxing games have attempted to provide a larger context for the left hooks and right crosses, but they are all statistically based. They generally let the gamer pick the fighter and even set the strategy, but leave the computerist holding the water bucket in the corner once the timekeeper rings the bell.

The first step before leather hits flesh is to design a boxer using a series of joystick-activated menu screens. After typing in the future Ali's name (up to 16 characters), the player determines the man's physical appearance, chooses an image, and picks one of five basic styles: dancer, boxer, mixed, slugger, or bulldog. This is a crucial decision, because it determines the boxer's computer-directed footwork during bouts.

Once the player makes these choices, the program generates the fighter's profile screen. This contains ratings for factors such as strength,



Star Rank Boxing *breaks new ground.*
READER SERVICE NO. 250



Island Caper: *the cold war continues.*
READER SERVICE NO. 251

stamina, endurance, and agility as well as intangibles like general attitude. It's a shame that the user can't directly determine the last-named factor, because no one really wants to guide the career of a boxer characterized as "negative."

The game disk holds up to 40 customized boxers. More can be saved on separate initialized disks.

The Circuit Status screen shows the current rankings. All new fighters start at the bottom, #19, and can only advance by vanquishing either of the two fighters rated directly ahead of them.

It's a long climb to the championship held by Boris Nicolenko. Along the way, a boxer must battle men with styles ranging from the toe-to-toe slugging of Bashin' Bill Snow to the deadly speed of Flash Fenwick.

Once the match is made, the boxer heads for training camp to get ready for the confrontation. There are five activities, each designed to build up one or more attributes. Roadwork improves endurance, which helps the man rebound from a knockdown, while sparring has a beneficial effect on stamina, the factor which governs between-rounds recovery.

After camp breaks, it's on to the ring to mix it up with a human- or computer-controlled foe. The well-drawn arena shows a side view of each combatant within a ring tilted slightly toward the gamer to aid visibility. The crowd sends up a cheer as the rivals close for action.

The boxers are fairly large on the screen, which makes it easy to see who is landing the punches. Although the figures look good standing still, the animation is a little stiff. More movement of the shoulders and upper body would have produced a more realistic appearance.

Since the computer handles the footwork, the computerist can concentrate on throwing punches and blocking blows. A joystick-based control scheme lets the boxer throw an assortment of inside and outside punches or protect the head or body from attack. A "thud" accompanies a punch which finds its mark, while a whooshing sound signals a clean miss.

Each round consumes three minutes of game time, equivalent to about one minute in the real world. After each round, an update screen displays the current condition of both men, the crowd reaction to the bout, and the officials' scoring using the "10-point must" system.

A fight ends when a man knocks out his opponent, scores a TKO by knocking him down three times in the same round, or gets the decision after the last round. A screen summarizes the outcome and displays the purse for both winner and loser. All results are saved to disk at the conclusion of a bout, so a fighter carries his record forward from one contest to the next.

The automatic footwork is both a blessing and a curse. It greatly streamlines the mechanics of fighting, though managers may yearn for the ability to move a battered battler out of range when a knockout threatens. Experience quickly teaches the wisdom of covering up in such situations.

No boxing simulation offers a more attractive mixture of strategy and lightning action. It's the kind of game that hooks the player immediately. In short, *Star Rank Boxing* is a knockout.

Gamestar, Inc., 1302 State St., Santa Barbara, CA 93101 (phone: 805-963-3487). *–Arnie Katz*

SPY VS. SPY: THE ISLAND CAPER

First Star Software
Commodore 64
Disk; $29.95

Mike Riedel once again proves that you can successfully combine action and strategy, suspense and humor, in the same piece of software. Like its award-winning predecessor, *Spy vs. Spy: The Island Caper* is a one- or two-player action-strategy contest featuring the comic strip characters created by Antonio Prohias for *MAD* magazine in 1960.

The two agents of chaos who battled over hidden secret plans in an embassy in *Spy vs. Spy* are matched against each other in another treasure hunt. This time, the black- and white-garbed rivals have parachuted onto a volcanic island where parts of an advanced missile are buried.

The foes must compete against each other and the ticking time bomb of the volcano. The one who unearths the three segments of the top-secret XJ4½ missile can escape with the assembled device in a waiting submarine.

The outstanding feature of this game is that everything happens in real time. The horizontally split display provides a window for each spy, so that players can move, search, and set traps as fast as their fingers can work the joystick or keyboard. By breaking through the rigid structure of turn-by-turn play, author Riedel creates a game which requires plenty of thinking, but which rushes ahead at the same breakneck pace as any fast-action arcade contest.

The trapulator, somewhat redesigned from *Spy vs. Spy*, is the focus of the struggle between the two madcap agents. It allows players to store and use various items en route to successfully completing the mission.

A lit L.E.D. next to an indicator button means that the spy has at least

one of that item in his possession. To pick up an item on the island, the player moves the spy next to it and presses the controller's action button. A second push adds it to the trapulator inventory.

Pushing the action button twice activates the Trapulator, which contains a batch of surprises for an unwary opponent. A spy can use the shovel to dig pits and punji stake traps, set up a snare with a rope, prepare coconut gasoline bombs, or even bury a canister of deadly napalm.

Each agent starts the game with 100 units of strength. This is depleted as a result of ordinary activities such as walking and swimming or as a result of setting off a trap. A sword cut during hand-to-hand combat costs the on-screen character three points, while a blast of napalm reduces strength by a whopping 40 units. A little rest permits a spy to regain some strength. An agent dies when the strength level hits zero, which gives the opponent a clear shot at scooping up the missile parts and catching the sub for home.

The graphics are beyond reproach. Each window scrolls independently in response to a spy's movement, which produces the satisfying illusion of spaciousness. The three-dimensional perspective allows an agent to walk toward the foreground or background, as well as left and right.

Spy vs. Spy: The Island Caper provides seven levels of difficulty. Among the variables are the amount of time before the volcano blows, the quantity of gasoline available for coconut bombs, and the number and size of the islands. The intelligence of the computerized player in solitaire games is also adjustable, so that novices and veterans alike will always feel challenged.

Some gamers feel that the excitement has gone out of entertainment software with the waning of the action game boom. *Spy vs. Spy: The Island Caper* demands quick thinking, but it's guaranteed to keep players on the edge of their chairs until the final seconds.

First Star Software, 18 East 41st Street, New York, NY 10017 (phone: 212-532-4666). *—Arnie Katz*

KARATE CHAMP

Data East
Commodore 64
Disk; $29.95

If, like most home computerists, you haven't visited a family amusement center since *Pac-Man* was only *Pac-Boy,* you've probably missed the hottest trend in play-for-pay machines. In an effort to lure back those who became jaded with endless shooting and blasting, coin-op manufacturers have developed a batch of quarter-snatchers which incorporate a lot of strategy while maintaining the fast pace of the classic shoot-em-ups and maze-chases.

You can put away the old coin-holder, because a good example of this new breed is now available in translation for the Commodore. The home edition isn't quite as electrifying as the arcade version, but it's an entertaining action-strategy test for one or two would-be martial artists.

The computerist directs a white-clad fighter using a fairly complex system of joystick commands. The coin-op employs a dual-stick system which could not be duplicated for the C-64 disk. The single-controller method works well, but most players will take several matches to memorize the various stick positions. That's unfortunate, because *Karate Champ* really comes into its own only after executing the various blows becomes second nature. The documentation wisely counsels neophytes to play test matches against a stationary opponent to get the hang of the command structure.

To order a move, the gamer points the joystick in one of the eight possible directions. Pressing the action button while doing this enables the gamer to access another group of moves.

In four cases, the same stick position actually invokes two different maneuvers. The computer determines which one is executed according to the distance between the fighters and what the opponent is doing at that instant. For example, pushing the joystick to three o'clock while holding the button yields a middle lung punch if the foes are widely separated or a front kick if they are close together.



Kick, punch, block, grow huge feet.
READER SERVICE NO. 252



Each encounter lasts thirty seconds, or until one fighter decks the other.

The display shows a side view of the martial artists along with an on-screen referee who announces the winner of each encounter in a square speech balloon. A contest lasts one to nine rounds, and there's a different background setting for each one.

A major innovation in *Karate Champ* is that the combatants don't always face the same direction or stay on the same side of the display throughout the bout. A somersault combined with an about-face shifts the fighter who started on the left side of the display to the right. This also flip-flops the control system, which doesn't make order-entry any easier. The extra complication is worth the trouble in this instance, however, because it makes the game more fluid and unpredictable than any previous martial arts program.

Timing is far more important than speed in *Karate Champ.* The on-screen surrogate performs each move at a predetermined speed, and it is not possible to program several blows

at the same time. Ordering a new blow before the fighter finishes the previous one aborts the move and leaves the man open to vicious counterattack. The idea is to enter a new order just as the fighter finishes the last one to mount a sustained attack.

Each encounter lasts 30 seconds or until one fighter decks the other. The judge awards a full or half point for a fall, depending on the nature of the blow and the quality of the execution. Two points wins the round. A separate score, which does not directly affect the outcome of the match except in the case of ties, provides an index of how effectively each man performs the various karate maneuvers.

The winner of a match earns the chance to accumulate bonus points by meeting special challenges. If the fighter can knock a flower pot out of the air, break boards, or stop a charging bull, it adds 200-2,000 points to his score. Successfully completing a bonus round gives the karate kid a chance to try again, up to a maximum of five bonus opportunities.

The learning curve is steep, but *Karate Champ* is assuredly worth the initial effort. When the joysticks are in the hands of two practiced gamers, it is one of the most exciting games to hit the computer screen in a long time.

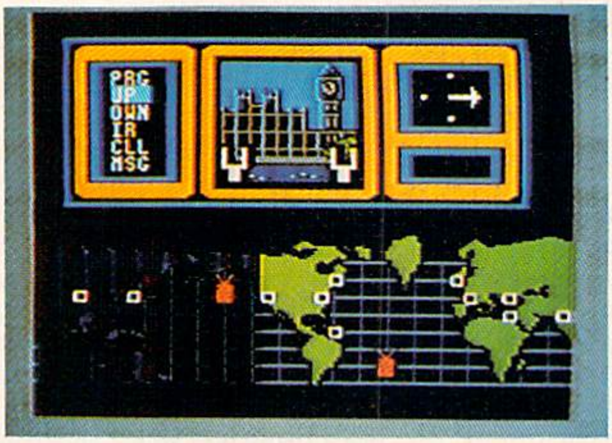
Data East USA, Inc., 470 Gianni Street, Santa Clara, CA 95054 (phone: 408-727-4490). *–Arnie Katz*

HACKER
Activision
Commodore 64
Disk; $29.95

Be prepared for a shock when you open the *Hacker* package: there is no documentation. Activision hasn't even included a little folder crowing about the "thrill of discovery."

It's no simple oversight. To the contrary, the absence of copious instructions, design notes, and the like is intended to slightly disorient the gamer and remove the security blanket which a rulebook represents to the purchaser of a new piece of software.

The anything-can-happen ambience is the perfect setup for *Hacker*. It promotes the willing suspension of disbelief which allows you to enter the topsy-turvy world of the game.



Careful Hack*ers will keep a note pad handy, as periodic security checks require you to give responses based on previously acquired data.*
READER SERVICE NO. 130

Booting the disk thrusts the player into the middle of a planet-threatening conspiracy. As an involuntary eavesdropper on a private computer network, the player discovers that a multinational conglomerate, Magma Ltd., plans a secret experiment which could blow up the world.

The gamer pieces together little bits of information which flash across the display to learn the full story. When a bulletin reports the theft of a document which could blow the whole rotten operation sky-high, the adventurer's course is clear: get that incriminating report and give it to the proper authorities.

This mission, the central theme of *Hacker*, should keep the computerist busy for many, many sessions of play. Someone has ripped the document into little pieces and given each shred to a different spy. To stop Magma's insanity, you've got to get that paper.

How do you contact secret agents located all over the globe without leaving the computer console? The same accident which let the gamer into the Magma network also gives control of a highly mobile scout robot. This mechanical probe can travel from city to city through subterranean tunnels.

Once the crusading computerist gets the probe to a world capital, sending a signal causes the local spy to appear. The trick is to figure out what price each agent will take for his piece of the document. Some want cold cash, and others specific items.

Most of the agents also have a list of items, including everything from a chalet to an autographed Beatles album, which they would like to sell to the player. The player must selectively buy these offerings, because some will be needed to get pieces from other agents.

Winning at *Hacker* is largely a matter of trial and error. The player tests various buying and trading strategies until the one which collects all the pieces of the Magma report is found. This is likely to require at least a half-dozen runs through the program, and probably more.

Hacker will appeal most strongly to those who enjoy memory tests. During the course of play, satellite security checks require you to give responses based on previously acquired data. The checks become more and more challenging.

Steve Cartwright has brought some of his videogame design experience to *Hacker* in the form of an eye-catching action sequence. When the gamer programs the robot for a new destination, the breakneck trip down the tunnel, shown in first-person perspective, lends excitement to what is otherwise a fairly cerebral contest.

The fact that *Hacker* is essentially a puzzle, albeit a complex one, is certain to enthrall some and repel others. It is fundamentally different from most other strategy games, because repeated play is an integral part of reaching the solution. Those who enjoy a protracted battle of wits will find *Hacker* a lively test of their abilities.

Activision, 2350 Bayshore Frontage Rd., Mountain View, CA 94043 (phone: 415-960-0410).

–Steve Davidson


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Music Shop	?	105 sec.	105 sec.*	105*	**21 sec.**
Hitchhiker's Guide to the Galaxy	?	70 sec.	70 sec.*	N.G.**	**68 sec.**
On-field Football	?	149 sec.	66 sec.	63 sec.	**56 sec.**
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1541 Read/Write Test
½ Track Reader
Header Reader (display disk header)
Sync Maker
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Electronic Arts Backup
Drive Mon (disk drive m/l monitor)
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Repair A Track (recover data)
Fast Format (10 seconds)
½ Track Formatter

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Disk Eraser (20 second clean wipe)
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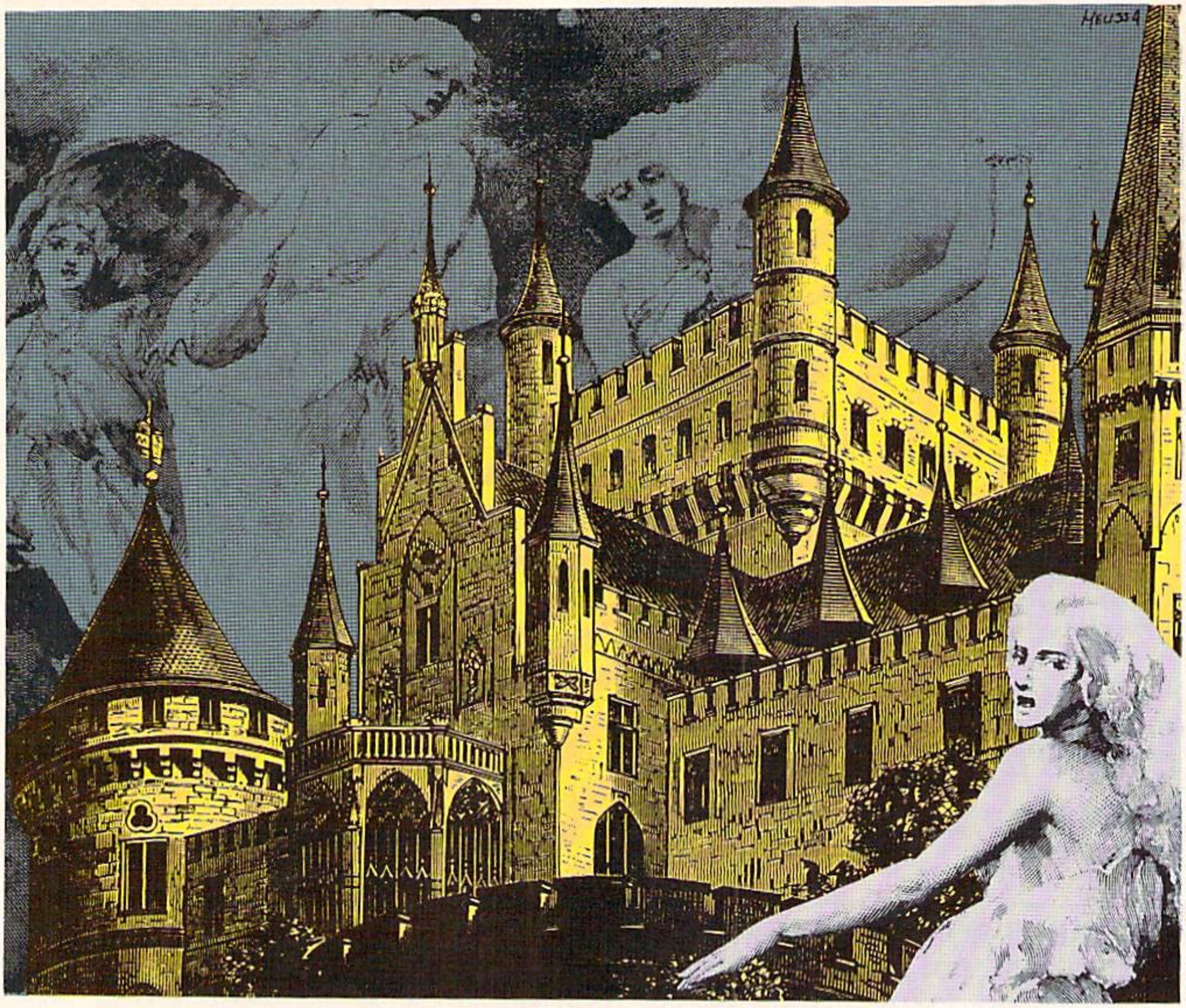
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THE HAUNTED CASTLE

For the C-64

By Derrick Brundage

Your task in *The Haunted Castle* is fairly simple: avoid the ghosts while searching the castle for three treasures. It sounds easy, but it isn't. First of all, the castle has over 1000 rooms (1100 to be exact) spread over 11 levels (100 per level). Second, the ghosts open and close the doors leading from each room at will, and you have no key with which to unlock them when they are closed. If a ghost catches you, it will steal a treasure and place it somewhere else in the castle. Should a ghost catch you without a treasure, the game will end.

Despite all this, you have a few things going for you. For one, you don't have to search all the rooms of each level for stairs and treasures. The number of the room you are currently in is displayed, as well as the room numbers of all staircases and treasures on that level. If the treasure location reads "NONE," there is no treasure on that level. Staircase room numbers work in the same fashion. Once you have found all three treasures, return to the room you started in (room 00 on level 0).

Movement is as would be expected: move the joystick in one of the four general directions and your character will move. You simply guide it away from ghosts and through open doors. To go up or down a level, just enter a room with a staircase going to the level you desire. Touch the staircase and WHOOSH!!! you're there. To get a treasure, enter a room with one and touch it.

After reading the above, it may seem that I've made the game too easy with all the room numbers. But the game is difficult enough with just the randomly opening and closing doors. In the original program, I left the player with nothing more than the current room number and the number of treasures, but the game proved far too difficult for my liking, so I added all the "extras." When you play the game you will find that it is still quite challenging, and it doesn't require nearly as long to play as the original, though it will still take about half an hour to play to completion.

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THE HAUNTED CASTLE

Variables, Strings, Arrays, and Line Numbers

ST$	Draw Stairs	A	General Purpose	B	General Purpose
SB$	General Purpose	X	Player's X Position in Castle	Z	Current Level in Castle
TR$	Treasure Room Number	SD	Start of Sprite Definitions	TC	Number of Treasures Collected
US$	Up Staircase Room Number	S	Start of Sprite Registers	C	General Purpose
DS$	Down Staircase Room Number	SO	Start of SID Chip	D	General Purpose
D$(x,x)	Draw Doors/Open Doors	SL	ML Sprite Left Routine	SS	Stair Status: Up or Down
W$(x)	Draw Walls in Doorways	SR	ML Sprite Right Routine	T	General Purpose
S$(x)	Staircase Location on Screen	XR	6510 X Register	CL	Number of closed Exits in Room
M	ML Main Loop	P	ML Animate Player Routine	TR	Room Status; Treasure or Ghost
U	ML Main Loop Status Register	Y	Player's Y Position in Castle		

Lines:

0-15	Initialization	39-65	Set up New Room	96-98	Read Data
-16	Main Loop	66-75	Initialization	99-122	Sprite Data
17-24	Movement Between Rooms	76-78	Found all Treasures	123-152	ML Data
25-31	Movement Between Levels	79-85	Display Information on Screen	153	Clear SID Chip
32-35	Grab Treasure	86-89	Title Page	154-156	Sound Effects
36-38	Gost Catches Player	90-95	Game Over – Player Killed	157	Draw Side Walls

For all the dedicated hackers out there, I have complied all the variables, strings, arrays, and line numbers used by the program and supplied a short description.

The program uses several ML routines, but they are all called at once by an ML Main Loop starting at 49750 decimal (variable M). One of the routines called by the main loop is needed by BASIC for animation when moving between rooms. This routine starts at 49496 (variable P). Of interest to BASIC programmers who need a little extra speed in their sprite programs are the routines at location 49176 and 49196 that move any sprite left or right one pixel; they even set the MSB when needed. Just POKE 781 with the sprite number multiplied by two and SYS the routine. These routines do not support wraparound so don't let your sprites past the borders. Also, these routines require the first 16 bytes starting at 49152. There is a sprite up routine at 49168, and a sprite down routine at 49172, but they would not be of much use simply because they wouldn't be much faster than an equivalent BASIC statement. However, if you do wish to use them, they work the same as the left/right routines and *do* support wrap-around. I am not one for writing neat, orderly ML code, so I extend a warning to all ML programmers: don't disassemble the code! It can get quite complex, in fact, it's a miracle some of it even works.

I enjoyed writing this game, and I hope you enjoy playing it. I welcome any comments or criticism regarding the program. ☐

SEE PROGRAM LISTING ON PAGE 137

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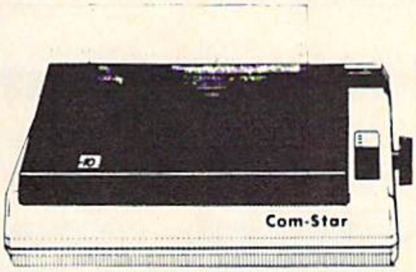
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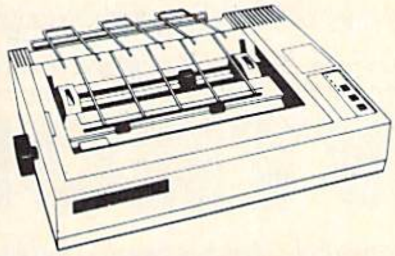
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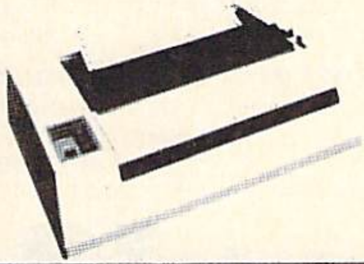
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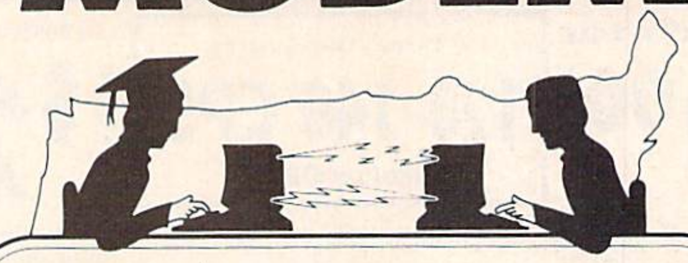
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KNOCKOUT

For the C-64

By Tony Brantner

Knockout is a boxing simulation which lets you step into the ring and slug it out with a human or computer opponent without even getting your hair mussed.

After running the program, the opening screen prompt will ask you to select either the one- or two-player version of the game. If you press "1" you will be given a choice of two skill levels. Level One offers a solid challenge to the amateur fighter, and a good sparring partner for the more experienced. Level Two is definitely for pros only.

You will now be shown an overhead display of the ring, with the fighter in white controlled by a joystick plugged into port 2 and the fighter in black controlled by either a joystick plugged into port 1 or the computer. As soon as you hear the opening bell, come out fighting. Moving the joystick moves your fighter in the corresponding direction, while pressing the fire button makes him throw a punch. You have two minutes to try to outscore your opponent by landing more punches, with the time elapsed within the round displayed just above the ring. You will receive one point for each shot you land. If you get 100 points, the match will be stopped and you will be awarded a technical knockout. Once the match has ended, press the f7 key to either defend your crown or try to avenge your loss.

Just like in real boxing, your best strategy is to "bob and weave," backing away from your opponent's punches and countering with your own. Trying to "brawl" your way through a match by forcing your punches can result in a humiliating loss. Don't dance around the ring too much though, or you'll find yourself on the ropes fighting for your life! □

SEE PROGRAM LISTING ON PAGE 140

★ ★ ★ **ANNOUNCING** ★ ★ ★

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Reader Service No. 265

THE MARTIAN MONSTERS

For the C-64

By James C. Hilty



"Spaceships are our favorite food—and we are getting hungry." These are the words that greet you on the title screen of *The Martian Monsters,* a game for the Commodore 64. After the title screen, a random starfield is drawn with the surface of the planet Mars on the bottom of the screen. A multicolored spacecraft attempts a landing when suddenly a swarm of monsters begins an attack. You have five ships at your disposal, but you'll need them all, because these pesky little creatures eat spaceships.

Hitting the monsters with your laser gains you points, while a monster catching you gets you gobbled up for lunch. If you miss the monsters when you fire your laser, all five of them will stop and laugh. Five misses with your laser will end the game. Losing all of your ships will also end the game.

Your spaceship is constantly moving horizontally across the screen. You control vertical movement by pushing the joystick up or down. Pressing the fire button fires your laser.

STRATEGY

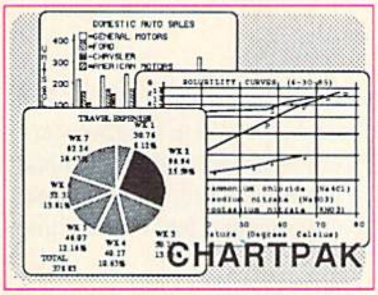
Hitting a monster with the laser will blow him up. But he rejuvenates himself almost instantly. Thus, if you fire at a monster when he is very close to you, he may come back to gobble you up if you're not fast enough with the joystick. Sometimes it is better to fly around and wait for a safe shot, but this increases the risk of a monster sneaking up on you and having a light snack.

AN ILLUSION OF SPEED

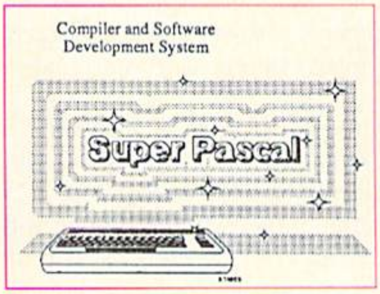
Things seem to move pretty fast in outer space. A short machine language routine (lines 5000-5230) causes the screen to scroll. The main loop (lines 850-970) keeps your spaceship flying horizontally and contains the joystick routine which allows you to control vertical movement. A machine language interrupt routine moves all of the sprites except your spaceship. This routine, like all interrupts on the 64, is read every 1/60th of a second. The machine language routines allow the main loop to be tightened up, creating a faster game and allowing error-free collision detecting. If your program does not have to read as many POKEs and PEEKs, then it can read your collision routines faster. When combining BASIC with machine language, the SYS command is often used. In this program SYS 49152 calls for the scrolling routine and SYS 51104 sets the sprite movement routine in motion.

Thus, the machine language routines scroll the screen and move the sprites, and the BASIC main loop moves your spaceship. You have monsters moving all over, your spaceship constantly in motion, a laser being fired, and the screen moving. You have an *illusion* of great speed. This illusion is very important in many arcade-type computer games, especially those written in BASIC.

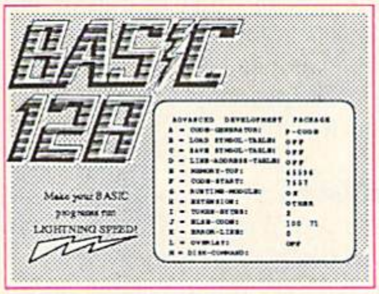
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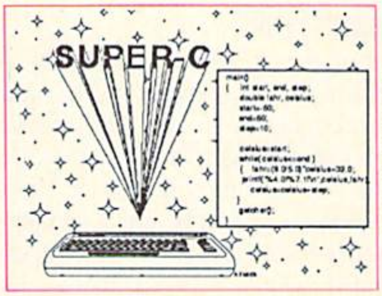
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AUDITIONING THE ACTORS

The five monsters are sprites. Initially they are all the same shape. Each monster sprite is a different color. The spaceship is a multicolored sprite (red, white, and blue). The laser beam is also a sprite.

The characters in a game need personality. The monsters, by their shape and color, appear "cute," which is what I wanted. By "quoting" the monsters through the use of several messages, a mischievous mood is created. The whining sound on the title screen also adds to the monsters' personalitiy, as this is their voice. While data is being read by the computer a message declares that the monsters "are building up an appetite." When the game is over, the monsters appear onscreen gloating with a friendly message.

The monsters go through changes as the game is played. If you miss a shot, all the monsters expand, turn sideways, and "laugh" (lines 2500-2550). Lines 3000-3270 allow the monsters to gobble you up if they collide with you. Your ship explodes and the monsters eats up the remains.

EATING A SPACESHIP

As mentioned, part of the monsters' personality is shown through different shapes and animation. The main loop (lines 850-970) checks each of the five monsters for a collision with the spaceship. If there is a collision the program branches to the "eating" subroutine (lines 3000-3270). The appropriate monster (found by giving variable Q the appropriate memory location for the sprite) is expanded horizontally and vertically by POKEing (V+23) and (V+29) with the appropriate values. The monster's shape is altered by continually POKEing different pointers in the sprite's memory location.

For example, sprite #2 is one of the monsters. The original pointers are set by POKEing 2042,192. All the monsters start out with their memory locations being POKEd with 192. Sprite #2 is expanded vertically by POKEing V+23,4 and expanded horizontally by POKEing V+29,4. The shape of the sprite is changed by POKEing location 2042 with values 195 and 196. This creates a "flip page" animation effect. Using a variable speeds things up—in this case variable Q for the sprite memory location and variable P for the sprite pointer. The following chart illustrates how this animation effect is used in *The Martian Monsters:*

Q=2042	(Sprite memory location for sprite #2)
P=195	(Pointer where sprite data pattern shows the Martian with his mouth closed)
	(Pointer 196 shows the same pose, but with the mouth open)
For T=1 TO 8	(How many times the Martian opens and closes his mouth)
POKE Q,P	(Changes the Martian's shape to mouth closed)
	(Changes the Martian's shape to mouth open when P=196)
P=P + 1; If P=197 then P=195	(Changes P from 195 to 196, then back to 195)
Next T	(Completes the loop for 8 "chewing cycles")

Since the collision routine in the main loop gives the memory location for the particular monster involved, the sprite retains its own color and position. A similar routine occurs when a missed shot happens, only rather than just one, all five monsters laugh using the same sprite pointers used for "eating." When hit by a laser, sprite pointer 197, a picture of an explosion, is POKEd into the monster's memory location. After a split second, his original shape is restored by POKEing 192 back into his memory location. Sprite pointer 197 is also used when the spaceship collides with a Martian monster.

SOUNDS

Sound adds a great deal of feeling to a game. In *The Martian Monsters*, sound also helps add to the monsters' personality. The different sounds of a monster eating and being hit lets you know what is happening in a game. The whining noise at the beginning and end of the game is actually the monsters' voice.

The sounds in *The Martian Monsters* change when you do not have control of the joystick—that is, outside of the main loop. This eliminates a slowdown in the game. This also allows for more elaborate sound. A monster can take his time eating your spaceship, since there is nothing you can do about it.

AVOIDING THE SEAM

Let's get back to the illusion of speed. The 64 has a seam in the screen approximately ¾ of the way across. The joystick routine which allows you to control vertical movement and the routine in the main loop which moves your ship horizontally are written in BASIC. To move the spaceship across the seam would require an additional line in the main loop (POKE V=16,1; POKE V+0,X). This line would permit horizontal movement across the seam. The addition of any extra lines slows down the game. To avoid having to contend with the seam, the portion of the screen to the right of the seam is used for displaying the title, score, ships, and missed shots. Thus, the game is not slowed down any more than it has to be. The machine language scrolling routine does not scroll this part of the screen.

SUMMARY

Mechanics are important in any type of programming. The program must do what you want it to. But in a game program other factors are equally if not more important.

You must be a magician or storyteller. You must quickly create characters and situations that are interesting and visually appealing. You are creating pictures and a mood. You are affecting the feelings of the person playing your game.

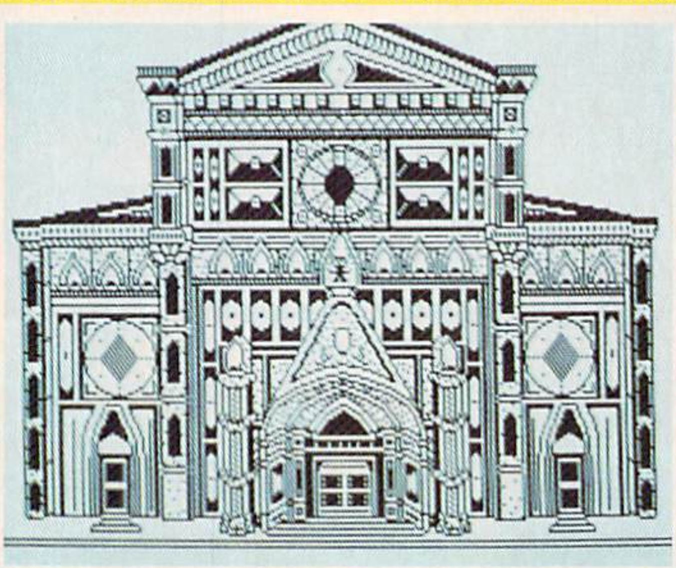
You must create a grand illusion with POKE and PEEK. At the conclusion of the game, when the "play again" option is displayed, you want the player to press "Y". Then you know that your illusion was a success. ☐

SEE PROGRAM LISTING ON PAGE 120



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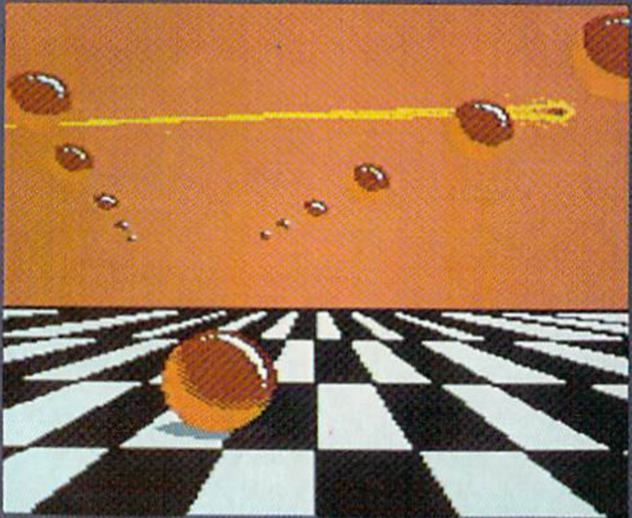




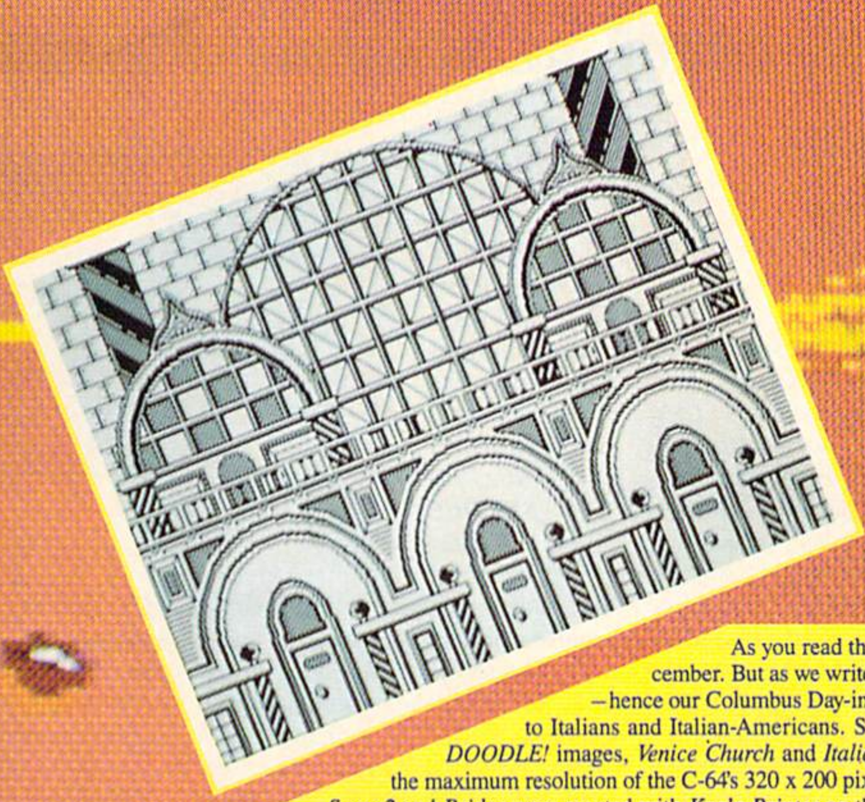
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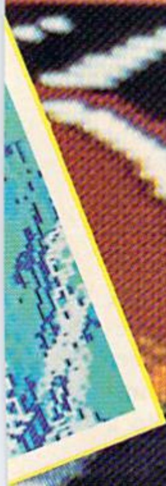
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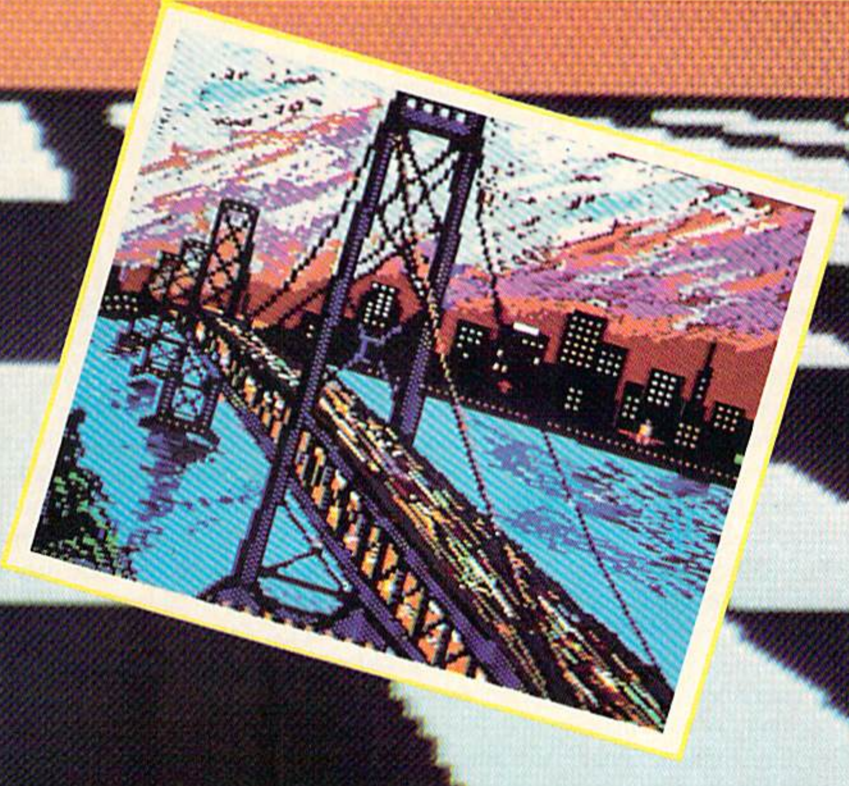






As you read these words, it's early December. But as we write them, it's early October – hence our Columbus Day-inspired *Art Gallery* salute to Italians and Italian-Americans. Steven Distasio's detailed *DOODLE!* images, *Venice Church* and *Italian Church,* demonstrate the maximum resolution of the C-64's 320 x 200 pixel hi-res graphics mode. *Space2* and *Bridge* were created with *Koala Painter* on the Koala Pad by Alberto Valsecchi of Milano, Italy – definitely a New Renaissance artist of the highest order. Saluting the great astronomer Galileo and forming the background for this month's images is *Comet* by Sean Huxter (Springdale, NF), who made his *Art Gallery* debut last month. The image is shown unobscured at lower left.





REVIEWS

DATA MANAGER 128
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Timeworks, Inc.
Commodore 128
Disk; $69.95 each



Timeworks' 128 versions of their spreadsheet, word processing, and database programs can share data with minimal inconvenience. READER SERVICE NO. 129

Timeworks' word processor, spreadsheet, and database programs, their first for the 128, are the equal of any I've seen. The three have many features in common, so I'll enumerate these, then get down to each one's strengths and (almost non- existent) weaknesses.

The good news starts as soon as you open the packages. A toll-free hotline number is printed on the inside front cover of the documentation for each program. The support person I spoke with knew the systems and said that she uses them exclusively.

At this writing, the programs work only in the 128 80-column mode. For those used to a 40-column character set, the 80 columns can produce splitting headaches within a short time. This is especially true if a monitor has any flicker to it at all. By the time this article sees print, Timeworks will be offering 40- and 80-column versions of *Word Writer* on the same disk. While going back and forth between the two will require reloading the appropriate version of the software, it will give the user a choice.

Because of the difficulty of getting all the necessary information on a 40-column screen, *Data Manager* and *SwiftCalc* will be available only in 80-column mode. Timeworks is planning to redesign these packages to run in 80 columns with the 1702 using the video out port, so a special cable connecting the RGBI port won't be necessary.

The documentation for each program is outstanding. An alphabetic glossary of terms at the beginning of each manual tells you what they're talking about in advance. A tutorial in the early pages teaches you how the main features of the program work. In each, you create a sample that with a little modification could actually be used for a purpose. Sample files are included on the disk and the manual is sprinkled with examples. A "facts at your fingertips" section in the back has a condensed version of the information found elsewhere, for those who like to just dive in and deal with problems when they arise. A section on troubleshooting and error messages can really help when things don't seem to be working right.

All three programs use a Macintoshlike menu bar and "pull-down" menus. Hitting the 128's escape key (ESC) puts the menu bar across the top of the screen. The arrow keys are used to highlight the option you want to use. Hitting the return key pulls down the menu so you can see what options are available. Again, the arrow keys are used to highlight the option you want. The RETURN key picks the option.

For instance, printing information with your printer requires choosing the print option in the menu bar. This calls up a sub-menu with the option to print on the screen or your printer. When you've made that choice a group of questions helps determine how your printout will look. After the questions are answered your document is printed. This is a very effective way for new users to work with a program because the computer prompts for all the information it needs to complete the action you initiate. However, as users gain experience with a program, menus can become cumbersome. I understand that the programs will soon include keystroke commands to use as alternatives to the menus.

The three programs include a "repeat the last command used" feature, so that you don't have to keep pulling down the menus to reuse a command.

All three programs include print drivers that will work with most of the commonly marketed printers and interfaces. They all have provisions for modifying the print control codes that are sent to the printer, so special fonts and sizes of type can be adjusted. All contain an option to designate the third number used in the printer "OPEN" command, as well as toggling the ASCII correction on or off.

As with previous Timeworks packages, the three programs can share files. Programs are included to create files that can be read by the other modules, making it possible to transfer data from the spreadsheet to a word processing document or from the data manager to the spreadsheet, etc. The word processor has a pull down calculator that easily puts the results of your calculations right into the document you're editing. The database program allows number fields and calculation fields that can include logic operators and "IF-THEN-ELSE" statements. The database will also create graphs of those

calculations or number fields (much like *Lotus 1-2-3* does for IBM users). *SwiftCalc* also graphs data for you and includes "IF-THEN-ELSE" operators.

The *Word Writer* program has most of the features that make a good word processor, including some of the most versatile cursor movement keys I've seen. The only movement command missing is backward or forward one word. Formatting of information in a document is relatively simple. Many format commands are in the print menu and do not have to be inserted into the document. A reformat command is included to handle changing margins mid-document or for an alternate printout.

A page break display is provided to show where each new page starts. Word wrap and insert are included; however, the insert is not an on/off toggle. Instead you must insert a character or line at a time. The delete functions are well planned and include delete character, word, or line. You can also delete a block of text or the remainder of a file.

Another nice feature is the memory remaining command. Since Timeworks chose to limit the size of documents to 64K, it's always reassuring to be able to check the space left. A more realistic document size limitation that you should keep in mind is the spelling checker's limit of 10 pages of text. Linking documents requires a bit of manual labor. Instead of inserting commands to load new modules automatically, the writer must print the first, load the second, print the second, load the next, and so forth. Unless a reset command is used to prevent it, each new document loaded in is treated as an extension of the last. The reset function puts the page number back to one.

The spelling checker takes about the same amount of time as others and will make corrections in the document. It is easy to use and fairly forgiving. Its dictionary is not too extensive, but you can add a supplementary dictionary of words you use that aren't in the main one.

SwiftCalc has most of the features of *Lotus 1-2-3*, and Timeworks plans to

Reader Service No. 119

add more. While it will currently create simple graphs of data, soon more complicated illustrations will be possible.

Cells are initially fixed at a given size, but can be adjusted to new widths as data is being entered. Cells can contain numerical data, labels, text, or formulas that reveal results of calculations. These formulas can contain up to 240 characters and use the cell names as variables. For instance, adding the first three cells in column one would be done by specifying a cell as a formula cell and entering its contents as A1+A2+A3. The numbers' appearance, whether or not to include dollar signs, and number of decimal places are easily adjusted. Scientific notation can be used if you prefer.

SwiftCalc has an automatic calculation feature that causes all formulas to be reevaluated each time a cell's contents are changed. While this is ideal for smaller spreadsheets, the recalculations can take much longer for more complex or lengthy forms. Since the C-64 can't handle data input while it is calculating, the wait can be annoying while you are manipulating the numbers. *SwiftCalc* has a feature to turn the recalculation off. A separate command is included to "force" the calculation manually. This is a real time saver.

SwiftCalc has features that you would find in a word processor, as well. You can add, delete, move, or copy cells, rows, or columns, or blocks of cells. You can also search or search and replace. Believe it or not, you can even set tab stops. A GOTO command lets you access any cell instantly.

Commands are also provided to check the amount of memory left and to freeze a row or column. The freeze command lets you keep your label fields on the screen, while helps prevent losing your place.

In addition to processing user-defined formulas, *SwiftCalc* has some built-in functions that are very useful. These include the minimum, maximum, and average value of a range, sum or value count of a range, absolute or integer value of a cell, and the present and future value of a dol-

lar or an annuity. These functions can be used within your formulas.

SwiftCalc's documentation includes extensive explanations of how to use these formulas and functions to their maximum and numerous examples which are included in the sample spreadsheets on the disk.

Like *SwiftCalc, Data Manager* allows you to use calculations with the data that you enter: not as complex as those in *SwiftCalc*, but perfectly adequate for a program that is intended to organize data rather than manipulate it.

Data Manager's manual gives a great set of instructions on how to set up your database. Once it is set up, the features to enter and organize the information are simple and effective. Special programs to sort and search are included, making it easy to isolate parts of your database to print or copy out to another file. The report writer (which is reached through the pull-down menus) makes it easy to print reports or labels.

The initialization procedure for setting up your database is simple and uses onscreen layout. Your layout can contain multiple pages and titles be printed or omitted. By properly setting up the database initially, anyone can sit down and start entering information. A function is even included to allow you to add new fields to the database after it's been created and data has been entered. Although new fields can only be added at the end of the existing form, this is vastly superior to having to redefine the entire form and reenter all of the previous information.

Written especially for the 128, all three programs reviewed make good use of the added memory and expanded keyboard.

Timeworks, 444 Lake Cook Road, Deerfield, IL 60015 (phone: 312-948-9200). *—Cheryl Peterson*

PLAYNET

C-64

Starter Kit $39.95 (see below)

The people who run PlayNET like to refer to their system as "the network that has people talking." Those of you who have not tried the system

might dismiss that slogan as typical marketing hype. If so, you would be missing out on one of the best values around for Commodore users. PlayNET really does have people talking! All kinds of people, from all around the country.

What are they talking about? Just about any topic you can imagine, from accounting tips to zucchini recipes and anything in between. They do this through the use of a function called "People, Games & More," which gives users from the smallest towns to the largest cities a place to meet and talk with each other and even play games together. The "People, Games & More" section of PlayNET is divided into electronic "rooms" that can each hold a dozen users at one time. There are several standard public rooms that are open to all users, called reception rooms. Although they are not only public rooms, these reception rooms provide a starting point for your electronic journey across the nation. By switching from one room to another you might discover a conversation about children's books or a weekly meeting of computer bulletin board system operators from major cities across the country. And if you don't find the conversation you're looking for you can start your own room simply by going to it. You can even start a private room where only those people you've invited can join you.

Another nice feature of the PlayNET system is the ability to send online messages or electronic mail to any other person on the system. Messages are delivered to the user in seconds wherever they might be on the system. If that person is not signed on when you want to send your message, you can leave electronic mail that will be waiting for them the next time they log on. And PlayNET is more than just talk. It's also games: games that you play against a real human, not a computer. Strategy games such as Chess, Checkers, Backgammon, and Capture the Flag; word games like Hangman; and card games such as Contract Bridge. In all there are 14 different games on the PlayNET system.

PlayNET also supports a wide variety of computer bulletin boards. Here, PlayNET subscribers can leave messages and trade information with other users about such topics as current events, arts and entertainment, hobbies and sports, and many others. Classified advertisements are also available.

Another interesting area is the PlayNET Shopping Center. Here PlayNET users may purchase a number of different items such as PlayNET T-shirts and key rings and various books and magazines. This area is currently being expanded and will soon be offering a much wider range of products and services.

The Software Delivery Service of the PlayNET system is an online area where subscribers can freely trade programs that they have written or public domain software obtained from other sources. There are three different ways of using the PlayNET Software Delivery Service:

1) The Personal File Transfer area is where one subscriber uploads a file to PlayNET. The file is then held for two days. During that two-day period the file is available to any other subscriber who knows the filename and the name of the person who uploaded it. There is a small fee for downloading one of these files.

2) The Software Trading Post is where members may buy or sell software that they, or other users, have written. When a program is uploaded to this area, it is made available to other users at the price specified. If another user purchases the program, the price is deducted from that user's account and added to yours.

3) The Public Domain Software Library is where any PlayNET user may upload or download public domain software. There is no fee charged for uploading, but a downloaded program will cost you 50 cents.

Each PlayNET Master Account has the option of creating up to ten additional sub-accounts, the first five of which are free. There is a small fee for each sub-account after that. Sub-accounts allow each family member to have his own individual account number and password, as

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well as individual onscreen name. Sub-account charges are automatically added to the master account for billing at the end of each month, and each sub-account may have a different credit limit attached to it. This allows the holder of the master account to create separate accounts for each person in the family without fear of running over budget. Just give the kids a monthly PlayNET allowance and turn them loose. Complete and comprehensive billing information is always available online, and you can even sign up a friend while online. For individuals without children, the sub-accounts allow multiple personalities online and PlayNET makes it simple to switch accounts without the need to logoff and sign back on.

In general, I have found PlayNET users to be just about the friendliest group of people around. Dropping into a reception room is sure to bring a chorus of hellos from the occupants, even if they are complete strangers. There is an overwhelming family feeling at work on this system that makes many other networks seem cold and impersonal by comparison. PlayNET supports and encourages this feeling by sponsoring many monthly events and activities. Special Interest Groups (SIGS) abound on PlayNET, with such subjects as life-sharing and Physical disabilities appearing alongside poetry readings and comic books.

There is certainly something for everyone on this system. In fact, I have only found two aspects of the PlayNET system disagreeable. The first is that it takes so long for the software to load when going from one area of the system to another. This is not a fault of PlayNET's but rather due to the slowness of the 1541 disk drive. Although the PlayNET software is not copyprotected, most fast loader programs will not work with it. The only fast loader that will function reliably is 1541 Flash from Skyles Electric Works. PlayNET is aware of this problem, though, and have told me that by the time you are reading this review they will have incorporated their own fast loader into the software. My second complaint with PlayNET is that they are only open from 6 p.m. local time to 7 a.m. eastern time, and 24 hours on weekends.

The suggested retail price of the PlayNET package is $39.95, and connection charges are $2.75 per hour with an $8.00 monthly service charge. You may sign up by calling 1-800-PLAYNET and tell them Captain B sent you. Please feel free to drop me a line any time you're on the system.

PlayNET Inc., 200 Jordan Road, Troy, NY 12180 (phone: 518-283-8682 or 1-800-PLAYNET).

—B.W. Behling

1541 DISK DRIVE ALIGNMENT PROGRAM, VERSION 2.0

CSM Software, Inc.
Commodore 64 and 1541
Disk; $44.95

Alignment, or more precisely the lack of it, is an affliction which many 1541 disk drive users are all too familiar with. Disk drive misalignment results from a combination of factors. The early versions of the 1541 were more apt to suffer from misalignment, due to a design deficiency in a critical part of the hardware. This was further aggravated by the "head bump" error checking used by early software protection schemes. Interestingly enough, we have found that Commodore was one of the worst offenders with regard to this type of primitive copy protection.

Although the 1541's hardware has been improved and copy protection no longer needs to perform a head bump, the disk drive may still need to be aligned from time to time. Some normal disk operations, such as formatting a disk, will cause a head bump. Many of the old protection schemes are also still around. Even with the most solidly constructed 1541, long hours of use will eventually necessitate adjustment of its mechanism.

The symptoms of disk drive misalignment are easily recognized. In its most severe form, all commercial software (which was presumably manufactured on properly aligned hardware) will refuse to load. If the drive is allowed to attain this sorry condition, other problems will manifest themselves. The most aggravating of these is the inability to read disks which were previously formatted on the same disk drive. The irony of this problem is that once the offending drive is properly aligned, your most recently formatted disks will become unreadable. The only solution is to copy these disks to a second aligned disk drive before realigning the first.

Fortunately, there is no need to allow matters to reach this deplorable state. The early symptoms of misalignment can be easily recognized by the alert user. At first a slight increase in the loading times of commercial software may become evident. This will shortly be augmented by an intermittent flickering of the disk drive's error light. In the advanced stages, the drive will seem to detect numerous disk errors. The resulting proliferation of "head bumps" serves to accelerate the process to the point where commercial software will not load at all. Very often many of these symptoms are mistakenly assumed to be the fault of the program disk rather than a problem with the disk drive. In the most extreme case the stepper motor cam will slip an entire track, effectively bringing the drive back into alignment. Unfortunately, this condition is only temporary.

For most users, disk drive misalignment will mean a trip to a qualified service technician. Use of the electronic instruments required is beyond the knowledge of the average user. The *1541 Disk Drive Alignment Program* by T. N. Simstad aims to eliminate the need for any electronic expertise from the alignment procedure, at the cost of a single qualified service call. The process is reduced to the execution of a purely mechanical series of operations. Of course, the ability to load the alignment program and use the computer is also required.

What is required of the user is a fairly good mechanical aptitude. The accompanying manual does provide step by step instructions, as well as prolix descriptions of the events in question. Unfortunately, the accompanying sketches provide only the es-

sential information as referred to by the text. Your own imagination will be required to bridge the gap from the physical presence of your disassembled drive to the primitive drawings in the manual – an exercise not made any easier by the three physical and electronic variations which have come about as the 1541 has evolved.

In addition to the manual, the package includes two disks: the alignment software and a precisely formatted alignment disk. Neither of these disks can be copied, although one set of backup copies is available for $15. The first disk is protected by some rather sophisticated copy protection schemes. Of course, copying the second disk would only negate the value of the original's precision.

The directory of the program disk may be viewed, but not LOADed and LISTed, using the DOS wedge on the 1541 test demo disk. Doing so reveals a copyright notice, some apparently humorous comments, and a tongue-in-cheek challenge to copy the disk. We suppose this goes hand in hand with T. N. Simstad's and CSM's other products, in particular *The Program Protection Manual For the C-64*, Volumes I and II. These books include detailed discussions on the various forms of hardware and software protection used by software manufacturers for the C-64. We can only conclude that the protection on this disk must be some form of final exam for these volumes. However, instructions for the grading of your results were not included.

Operation of the program is straightforward, although loading it may present a problem. The complex copy protection and the expected sorry state of your disk drive may conspire against the successful booting of the package. In the worst case a second disk drive may have to be called into service. This may require some swapping of disk drives, as the program will only boot from device eight. However, once loaded, the alignment may be performed on disk drives with any legitimate device number. You may also have to disconnect any other serial bus devices, as the copy protection scheme is

sensitive to these otherwise innocuous intruders.

A number one Phillips head screwdriver, in very good condition, is also required. We have found the stepper motor hold down screws to be very tight on most 1541 disk drives. Using a worn screwdriver will chew up the head, requiring heroic measures to undo the damage.

The alignment program provides several menu selections. Speed accuracy is important to disk drive operation. The actual drive speed is displayed and continuously updated as a percentage of the proper speed. Adjustment can be easily made in real time. You will need a formatted "scratch" (i.e., no valuable data) disk for this purpose. The main menu has a format disk option which interestingly enough refused to format an unformatted disk. On the other hand, a preformatted disk formatted just fine. This is clearly a utility of futility. Just remember to format a disk before you start. The two-minute boot time of the alignment program is not to be taken lightly.

Two alignment checks are provided. The coarse adjustment sets the read/write head over track one. The head stepper motor must then be set to center the head between the alternate positions of noticeable disk drive error. This is the point where the disk error light just begins to flicker. The proper position is then determined by rocking the stepper motor between these two points.

The fine adjustment process is far more critical and time consuming. A total of nine tracks are cyclically scanned by the program. Although the readability of each track is noted, it is the timing of the entire cycle which is important. The objective is to minimize the time it takes to run a cycle check. Since each cycle takes at least 30 seconds, this iterative process can become lengthy, in particular towards the end when the setting of the stepper motor is somewhat touchy.

In addition to the head alignment, the track one stop must be properly set. Failure to do so will cause the drive to have difficulties in formatting a disk. The symptom of an improperly set stop is the inability of the drive to read track one on a disk which it had just formatted. The setting of the track one stop is purely mechanical. The program positions the head over track one and requires the stop to be adjusted within .006 to .01 inch of the stepper motor cam. The hard part is the lack of any refined adjustment mechanism on the disk drive itself. Most 1541's have a single screw holding down the track one stop. Tightening this screw invariably upsets the stop's position. As a result, the whole procedure becomes somewhat hit or miss. Fortunately, the track one stop rarely needs adjustment.

As a last resort, the manual addresses the underlying cause of disk drive misalignment. The earliest 1541's are the ones most likely to suffer from this fault. Once the drive loses alignment there is an increased tendency for misalignment to reoccur. The manual recommends what we believe to be the only truly effective cure, pinning the stepper motor pulley to its drive shaft. Unfortunately, the precise drilling of a hole through this miniature shaft requires a rather specialized set of tools and skills.

Overall the *1541 Disk Drive Alignment Program* offers a viable, purely mechanical alternative to a fully instrumented disk drive alignment. The program also offers a fast and effective means of periodically checking the disk drive's speed and alignment. However, a full alignment using the CSM method will take longer than a "traditional" calibration with proper test instruments. A description of at least one instrumental alignment should have been included as an option for the qualified user.

CSM Software, Inc., P.O. Box 563, Crown Point, IN 46307 (phone: 219-663-4335). *—Morton Kevelson*

SUPERFORTH 64
Parsec Research
Commodore 64
Disk; $99.00

SUPERFORTH 64 is my fifth. My fifth review of a version of the FORTH language, that is. Writing reviews is usually like Christmas—tear off the wrapping and play with a new

toy. I have to admit that my heart dropped when I realized that writing this review was going to seem like déjà vu.

You see, FORTH as a generic computer language has some pretty well-recognized standards. True, there are a couple of variations on the theme, but FORTHs are typically much more similar to one another than are, say, BASICs. I didn't initially see how reviewing *SUPERFORTH 64* would involve much more than checking it against the standards and then trying to find an interesting way to tell you how different FORTH is from other computer languages, in both style and power.

Parsec Research had a few surprises for me, however, and I ended up having balls of fun and getting back into FORTH more than I had been in years. (Yes, I used to and still occasionally do program in FORTH. It is much faster than BASIC and it reinforces some good programming habits.)

Programming in FORTH forces you to structure your thinking and your code. Imagine a BASIC program that is totally modular, with the modules loosely strung together. The main body of that BASIC program might look like:

```
10 GOSUB 1000
20 GOSUB 2000
30 GOSUB 3000
40 GOSUB 4000
```

Each line in the main body might, in turn, direct you to another series of modules until you finally reach small blocks of free-standing code. Those blocks are FORTH words. Words in FORTH are compiled into a collection called the dictionary. A word in the dictionary may be nothing more than a series of other words linked together.

FORTH code is organized into physical and logical screens, essentially computer screenfuls of code. Source code screens are loaded into the system and compiled before they can be used. Once compiled, a source word can be called interactively or used in the definition of a new word. *SUPERFORTH 64* includes a decompiler, a trace facility, and a non-destructive stack dump, all to ease your debugging efforts.

FORTH's stand-alone words force your programming into a linear style and make debugging oh-so-easy. But what's special about *SUPERFORTH 64*, you ask? Well, it contains all the words required by the FORTH-79 standard and a bunch of those defined by the FIG (FORTH Interest Group) FORTH standard. It is actually a superset of the MVP-FORTH system. (I told you it follows the standards—as do all versions of FORTH.)

But *SUPERFORTH 64* goes beyond the other FORTHs I've used by giving you lots more words to start with. The predefined word set includes (bear with me here!): 15 editor, 13 source screen file mode, 8 byte/bit manipulation, 26 I/O, 11 Kernal interface, 36 utility (including backup), 50 graphics, 33 Turtle graphics, 23 sound, 11 music editor, 20 string extension, 6 interrupt, 4 display, 4 high RAM access, 2 array, 9 floating point, and 6 trig words. (Total 262.)

Furthermore, *SUPERFORTH 64* gives you an extension package for floating point math, with support for either decimal or scientific notation form. And it gives you words to manipulate two- or multi-dimensional matrixes. And an algebraic expression evaluator, so you do not have to work in FORTH's standard Reverse Polish Notation (where 2 + 2 is written 2 2 +). And an RS-232 word set. And a printer/plotter word set, for the 1525 and 1520. And even a couple of Koala pad utility words.

This is like buying BASIC and receiving several disks full of powerful subroutines and utilities thrown into the bargain. *SUPERFORTH 64* does, by the way, come on four disks—actually, on both sides of each of two disks. With all the extension packages and the source code, there's a lot to learn here. Although FORTH is about as different from other computer languages as it can be, this *SUPERFORTH 64* package is just waiting for you to jump in and use its power.

If all that is not enough, you even get the chance to dabble in artificial

intelligence. A program called *EXPERT-2*, written in FORTH, is provided as an inference machine. *EXPERT-2* is primarily a learning tool that allows you to compile expert rule programs and to perform logical inferences on these rules.

Your *EXPERT-2* programs can have two components—a set of If-And-Then rules to manipulate truth values and a set of analytical subroutines. Playing with *EXPERT-2* can give you some good insights into human reasoning that is based on recognizing and sorting patterns to form the types of "rules" we each use daily. Eight example programs are included on the disk to show you how to use rules to do such things as predict the weather or analyze a digital circuit.

The only language you are likely to have used that is faster than FORTH is assembly language. If you are familiar with assembly language, *SUPERFORTH 64* will accommodate you. It contains an integrated assembler that will allow you to rewrite time-critical FORTH words to run in machine language. FORTH assembly code looks much like 6502 assembly code, except that FORTH's structured approach is maintained so 6502 branching commands are not included. If you have written your own assembly language routines, *SUPERFORTH 64* will allow you to use them after going through a simple conversion process.

SUPERFORTH 64 includes 500 pages of manual and tutorial materials just to cover the basics. The printed materials specifically do not cover in detail FORTH programming or artificial intelligence. Plan to buy one of the standard texts on these topics. Parsec does reference many good books, including all the standard FORTH programming and reference guides.

To help you get started, and assuming that most of us are familiar with BASIC, Parsec has included a BASIC to FORTH command translation table. It won't help you understand the structural differences between the languages, but it will make the vocabulary meaningful. And right there on page one of the manual, Parsec lists its address and phone and invites us to report problems, ask questions, and give user feedback.

Parsec Research, Drawer 1766, Fremont, CA 94538 (phone: 415-651-3160). *—Richard Herring*

BLUE CHIP D12/10 DAISY WHEEL PRINTER
Blue Chip Electronics, Inc.
Price: $249.00

The Blue Chip D12/10 is a low-cost daisy wheel printer intended for home applications. It cannot be said that it is the best performing printer ever released, but it has to be looked at from a home market point of view.

I found the D12/10 virtually identical in performance to the Brother HR-15. This is no surprise, for the D12/10 is manufactured by Brother. As a matter of fact, the rear of the printer is stamped Brother HR-10.

Print speed is a lethargic 12 characters per second. This is slow, but bearable. Additionally, there is a 2K buffer that will free your computer while the printer is busy.

The print qualify is in line with other printers of this type. It's clear and aligned well, making it quite acceptable for most home applications. Any of the standard Brother daisy wheels will work with the printer, giving the user a wide variety of fonts to choose from.

The D12/10 has the ability to perform an assortment of tricks. These include automatic underlining, strikeout, shadow print, and double strike. It can also move the carriage in 1/120" increments for precise alignment of text.

Interfacing is achieved through a standard Centronics parallel port. In order to connect it to your Commodore you must purchase the proper interface. As this is not a dot matrix printer, and thus incapable of reproducing onscreen graphics, the least expensive, non-graphic interface should suffice.

The Blue Chip D12/10 isn't going to win any awards, but for home use should be more than adequate.

Blue Chip Electronics, Inc., 2 West Alameda Drive, Tempe, AZ 85282 (phone: 602-829-7217).

—David Barron

MICROSIM

A Flight Simulator for the C-64

By Tim Gerchmez

I was inspired to write *Microsim* when I purchased a commercial flight simulator package for the C-64. I had never before realized just how exciting it was to fly—the feelings of freedom and power are fantastic. This flight simulator is not as realistic as others available commercially. It is written in BASIC, which means that several things had to be sacrificed. *Microsim* is meant for entertainment purposes only: it is not intended to simulate any particular real aircraft. Please do not assume that because something works a particular way in *Microsim*, that's the way it works in real flight (though that may be the case). Also, please realize that *Microsim* is *not* a teaching tool—if you want to learn to fly an aircraft, be sure you take real flight lessons with a certified flight instructor.

To use *Microsim*, type it in and SAVE it. When you first RUN the program, the instruments will zero themselves out, and the cabin of the plane will pressurize. Following pressurization, you will hear two bumps signifying that the plane has landed. From here on *you* are in control.

Microsim uses keyboard input to control its instruments. First of all, let's go over these controls. The plus and minus keys control the engine RPM's (indicated by the ERPM indicator). Pressing plus speeds up the engine and minus slows it down. The minus key also acts as a brake for the aircraft when on the ground.

The greater than and less than keys (> and <) control the rudder, which steers the aircraft. You can use these keys either shifted or unshifted. (will bank the aircraft left, and) will bank it right. The HEADING indicator shows the current compass heading of the aircraft, and the BANK INDICATOR (indicated by BI> on the screen) shows which way the aircrat is banking. Imagine the BANK INDICATOR to be a view of the aircraft from the rear.

The U and D keys move the aircraft's ELEVATORS up or down, respectively. When the ELEV. indicator reads a positive number, the elevator is up from center. This tends to pull the nose of the aircraft up. When the indicator reads below zero, the aircraft will tend to pitch downward. The elevator can therefore be used to control the plane's altitude.

Pressing R or L will Raise or Lower the plane's FLAPS. The flaps work along with the elevator to help control the plane's altitude. In *Microsim*, the flaps should be down when taking off, and up when landing.

Press H to "hear" ATIS (Automatic Terminal Information Service). ATIS will display the current temperature, barometric pressure, and visibility conditions. It will also display the total number of nautical miles your aircraft has traveled since you booted the simulator (or since your last crash). This is indicated on the screen as TNMT (Total Nautical Miles Traveled).

Pressing the X key will refuel the aircraft. You have two fuel tanks available, the "green" tank and the "red" tank. Both tanks will be refueled with this command. This keypress works on the ground only (ever heard of a floating gas station?).

The number keys 1-4 control the indicators labeled 1-4 in the lower right corner of the instrument panel. These instruments will be covered shortly.

Pressing the 0 key will toggle between day and night flying. The program starts out in day flying mode. In *Microsim*, the only difference between flying in the day and flying at night is the "color of the air."

Finally, pressing the O key will cause the simulator to take an automatic demonstration flight. This command will be covered further in a while.

KEY CONTROL	QUICK REFERENCE
+ –	= Throttle controls
> <	= Rudder controls
U D	= Elevator controls
R L	= Raise/Lower flaps
H	= Hear Terminal Information
X	= Refuel aircraft
O	= Demo mode
0	= Toggle day/night flying situation
1	= Raise/lower landing gear
2	= Set fuel mixture
3	= Carb heat on/off
4	= Select fuel tank
5	= Lighting on/off
6	= Air conditioning on/off
7	= Cabin heating on/off

Now let's discuss some of the instrumentation not already covered. The TIME display shows a real time clock that is reset to zero each time you take off. Thus it indicates total time in the air. The GROUNDSPEED indicator measures the speed of your aircraft while on the ground. The FUEL and OIL TEMP. gauges are pretty much self-explanatory. The light with the P under it turns red when the cabin is pressurizing. The STALL WARNING LIGHT turns on when the plane drops to within 5 MPH of stalling in the air. If this light turns red, you should either decrease your elevator or speed up the engine. The altimeter displays the current altitude of your aircraft above ground level.

There are 4 instruments to the lower right of the instrument panel which are controlled with the number keys

1-4. Instrument 1 retracts and releases the plane's landing gear. When the indicator is red, the landing gear is out. Be sure you retract the landing gear in the air only, to avoid an embarrassing situation. Instrument number two controls the carburetor fuel mixture—white is lean, red is the normal rich mixture for flight. Instrument number three controls carb heating, which prevents the carburetor from icing over on cold days. Red is on, white is off. Since the air temperature is always warm when using *Microsim,* you need not use this control if you don't want to. Instrument 4 indicates which fuel tank is currently in use, the "red" or the "green." Each of the number keys 1-4 toggles each indicator to one particular setting or the other.

The Collision Warning Indicator (CWI) is a radar instrument that will turn red when there is a collision danger to the aircraft. This could be almost anything—a flock of birds, another aircraft, etc. The CWI becomes active at some arbitrary altitude above 4000 feet. When it turns red, use the > and < keys to steer your aircraft out of the way. In *Microsim,* dangers exist only in one dimension (you cannot fly above or below an obstacle to avoid it—you must steer around it).

Finally, to round out the complement, there are three indicator lights to the right of the instrument panel. The top light indicates whether the aircraft's external wing/tail lights and internal lighting are on or off (red=on, white=off). The middle light indicates whether the cabin's air conditioning system is on or off (red=on, white=off). The bottom light indicates whether the cabin heating system is on or off (red=on, white=off). Press 5, 6, or 7 respectively to toggle each of these functions on or off. The heating, air conditioning, and external lighting cause fuel to be eaten up a little faster than usual, so don't use them unless it's necessary.

When you first RUN *Microsim,* choose the demo flight (Press O) to get an idea of how to fly the aircraft. Let's go through a quick test flight right now. Read the following and follow the instructions:

1. With the plane on the ground, press and hold the plus (+) key to rev up the engine. Hold this key down until your groundspeed indicator shows around 65-75.

2. Hold down the U key to raise your elevator, until the indicator shows about 25-30.

3. Press the L key to lower your flaps. The aircraft should now take off, which will be indicated by the border of the screen turning blue (or black at night).

4. Lower your elevator (using D) until it reads below 5, to keep the aircraft from ascending too fast. Then press the 1 key to retract your landing gear. As you climb skyward, keep an eye on the airspeed indicator—the engine of this plane slows down intermittently. Apply a little throttle if need be. Also watch your altitude—the plane will quit if it goes above 31000 feet. Adjust the elevators for level flight once you reach cruising altitude. If you're flying above 4000 feet, keep an eye on the CWI (collision warning indicator). If it turns red, steer the plane out of the way using the rudder controls. Be quick about it! If you're going over 100 MPH when the CWI turns red, you will have only seconds to steer out of the way before a collision. (Note: If you pass through a cloud layer, the screen border will turn white.)

5. Landing—I'll leave this up to you, to provide you with a challenge. A few hints: decrease your speed to below 80 knots before landing, or your plane will bounce severely and you will crash. Remember to put your flaps up, or the plane won't land. Also be sure to lower your landing gear before landing, or the result may well be unpleasant!

Some of *Microsim*'s functions can be optionally controlled with a joystick plugged into Port 2. To increase or decrease throttle, hold down FIRE while pushing the stick forward or backward. To raise or lower the elevators, push the stick forward or backward without pressing FIRE. To move the rudder left or right, push the joystick in the corresponding direction.

I hope you have as much fun using *Microsim* as I had writing it (and I did have a very good time). If you have any comments or questions regarding *Microsim,* write me care of *Ahoy!*. Please restrict yourself to questions about the program—I am not a pilot. Also, please, no letters from pilots telling me how unrealistic my simulation is—it is not meant to be completely realistic, just to be an enjoyable simulation. I guess you could say *Microsim* is a flight simulator SIMULATOR. □

SEE PROGRAM LISTING ON PAGE 133

SCRATCH PAD

For the C-64

By Don Schmidt

If while programming you're not using the area of memory from 49152 to 53247 (user RAM), *Scratch Pad* may be helpful for a variety of purposes. The program allows you to create in the direct mode and safely store three 'screenfuls' of information (three 1000-byte blocks) in the above area of your Commodore 64's memory. Once stored, each of the 1000-byte blocks can be instantly reprinted to the screen at the touch of a single key.

You can design your own reference material or cheat sheets, use one or more screens as a scratch pad to jot down important notes or calculations, or maintain an ongoing 'Table of Contents' of your program's subroutines and their line numbers and keep a record of all your variable symbols and what they stand for. You'll quickly learn that you can also use *Scratch Pad* as a general file for letters, recipes, graphics designs, addresses, and much more.

Type in *Scratch Pad* exactly as listed on page 123 and save it to disk or tape before running it. Then run the program, and when the READY prompt appears type SYS 49188 and press RETURN. If you haven't made any typing errors, pressing the f1, f3, or f5 key should fill the screen with garbage. What you are seeing are the 1000-byte blocks of 'unprepared' memory.

Now clear the screen (if you do so by pressing the RUN/STOP-RESTORE combination, you'll have to SYS 49188 again to reactivate the program). Print anything you want to the screen. To avoid the SYNTAX ERROR message, press the SHIFT and RETURN keys together instead of the RETURN key alone to return the cursor to the left edge of the screen. When the screen is prepared the way you want to save it, home the cursor and press the SHIFT key and the f1, f3, or f5 key together. This should have saved your screen of information. Now clear the screen and press the same function key *without* the SHIFT key. Your screen of information should reappear. You can recall, modify, and resave your screens as often as you wish.

The second listing (see page 124) is a *Load/Save* routine written in BASIC, but using several of the Kernal's machine language routines to save and load your screens to and from disk or tape. *Load/Save* not only allows you to save the screens you have designed, but the machine language of *Scratch Pad* as well. So when you load your screens back into memory, *Scratch Pad* is automatically loaded and activated and all you have to do is press the function keys. ☐

SEE PROGRAM LISTINGS ON PAGE 123

PROGRAMS THAT WRITE THEMSELVES

Simple and Relative Address Modification

By Mark Andrews

One of the most strange and wonderful features of Commodore 64/128 assembly language is the availability of a programming technique known as address modification. Once you know how to use address modification, you can create machine code that will actually rewrite itself on command, sometimes saving enormous amounts of money and processing time.

Here is a short subroutine that shows how the principle of address modification works:

```
ASSEMBLY LANGUAGE              MACHINE LANGUAGE

Label     Code                 Address  Code

ADDRESS   LDA VALUE            8040     AD A7 02
          INC ADDRESS+1        8043     EE 41 80
          BNE NEXT             8046     D0 03
          INC ADDRESS+2        8048     EE 42 80
NEXT      RTS                  804B     60
```

Examine this subroutine carefully, and you'll see that when it is called, the accumulator is loaded with a number labeled VALUE. This value could be any eight-bit number. In the above example, however, the value of VALUE is the hexadecimal number $02A7. Look closely, and you can find the $02A7 in the language listing of the above subroutine. It is the number listed, low-byte first, following the hexadecimal number $AD in the first line of the listing. (The value $AD is the machine language equivalent of the instruction LDA.) So, when the subroutine listed above is executed, the first thing that will happen is that the accumulator will be loaded with the value of memory address $02A7.

Loading the accumulator with an eight-bit value is a simple enough operation. But in the next three lines of our sample subroutine something quite extraordinary happens. The algorithm that is used in these three lines is a common operation for incrementing a 16-bit number. But just what number is being incremented in this example? Once you know the answer to that question, you'll know the secret behind address modification.

Take a very close look at the second and fourth lines of the illustrated subroutine, and you'll see that the value being incremented is whatever 16-bit value happens to reside in a pair of memory addresses labeled ADDRESS+1 and ADDRESS+2. And what addresses are those? Well, when the subroutine that we're examining is assembled into machine language and loaded into memory, the machine language equivalent of the assembly language instruction LDA will be stored in a memory address labeled ADDRESS. And this address, as you can see by consulting the machine language column of the listing, is memory location $8040 (the dollar sign indicates that the address is a hexadecimal number).

Now the plot thickens. When our sample subroutine is assembled and executed for the first time, the accumulator will be loaded with the value stored in memory address $02A7. Then, in the next three lines of the subroutine, the operand of the mnemonic LDA will be incremented from $02A7 to $02A8. So the next time the subroutine is called, the accumulator will be loaded not with the value of memory address $02A7, but with the value of memory address $02A8. And the operand of the instruction LDA will continue to be incremented in this way every time the subroutine is called.

If you're familiar with indirect indexed addressing, you'll probably notice that indirect addressing and address modification can be used in a similar way. But address modification has certain advantages over indirect addressing in some applications.

Some programmers don't like to use address modification because routines that make use of it are not easily transportable from one program to another, and are often somewhat difficult to understand. Nevertheless, address modification is a very powerful technique that is used quite often in high-performance assembly language programs. Routines that use address modification are compact and fast-running, and they leave the X and Y registers of the 6510 chip free for other uses. And, although address modification routines can be used in much the same way as zero-page indexed addressing, they don't require the use of zero-page memory, which is always in short supply. So a thorough understanding of address modification techniques can be of great value to an assembly language programmer.

RELATIVE ADDRESS MODIFICATION

A more sophisticated variety of address modification, called relative address modification, is used in the assembly language program called SKETCHER that appears on page 142. SKETCHER is a completed version

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of a program that was presented, broken down into two parts, in last month's column. With the SKETCHER program and a Commodore-compatible joystick, you can draw high-resolution pictures on a computer screen. When you've finished drawing a picture, you can hit your joystick's trigger button and clear your screen.

In the SKETCHER program, relative address modification is used to make the program branch to a set of subroutines labeled UP, DOWN, LEFT, and RIGHT. These subroutines are used to detect the direction in which the joystick is being held, and to move a cursor in a corresponding direction on the screen. As you may know, this is one way in which an ON...GOTO routine could be used in a BASIC program.

The address modification routine in SKETCHER makes use of a data table that appears in Lines 414 through 424. This table is labeled RELADS (which stands for "relative address"). But the values of the bytes in the RELADS table are not defined as specific numbers. Instead, each value in the table is defined as the result of a subtraction operation—specifically, as the difference between the address of a given value in the table and the address of a line labeled MODR1 in the SKETCHER program. The line labeled MODR1, as you can see by studying the SKETCHER program, is the first line in a series of joystick-reading routines. So, by using the addresses of MODR1 as a base, the address of each joystick-reading routine in the program can be easily calculated.

Look carefully at the RELADS table, and you will see that each value in the table is equal to the address of one specific joystick-movement routine, minus an offset value that corresponds to the address of Line 294 of the SKETCHER program—the line labeled MODR1. And that is how the address of MODR1 is used to calculate the addresses of the joystick-reading routines in the program.

The segment of the SKETCHER program that uses address modification extends from Line 289 through Line 297. In Line 290, the direction switch of a joystick has just been read, and the value thus obtained has been stored in the 6510 chip's X register. If the joystick's trigger button is currently being pressed, the screen is cleared and the joystick is read again. If the trigger button has not been pressed, the accumulator is loaded with an eight-bit value that points to a specific address: namely, the address of one of the joystick-movement routines in Lines 298 through 350 of the SKETCHER program. An offset that points to the address of the desired routine is then calculated and stored in an address labeled MODREL+1.

The address of MODREL+1 can be found in Line 293 of the SKETCHER program:

```
293 MODREL BNE *
```

In assembly language programs that are written using the *Merlin 64* assembler (as this one was), an asterisk used in the above fashion is always interpreted as the current value of the assembler's program counter. So, when the above line is assembled into machine language, memory addresses MODREL+1 and MODREL+2 will hold nothing but a 16-bit value pointing to the address of MODREL+1. However, as soon as SKETCHER is executed, the contents of MODREL+1 and MODREL+2 will be changed. MODREL+2 will retain its original value, but MODREL+1 (the low byte of the value stored in MODREL+1 and MODREL+2) will be changed to whatever value is currently stored in the accumulator. This value, as we have seen, will now be the value of a specific byte in the data table labeled RELADS. And each byte in that table, as mentioned previously, is an eight-bit pointer which the SKETCHER program uses as an offset to calculate the address of a specific joystick-movement routine.

Address modification is quite an advanced concept, even for an experienced assembly language programmer. So if all of this seems a little foggy at first, please don't despair. Just run the SKETCHER program, observe what it does, and take another look at the program to see how it does it. Once you understand what the program does, learning how it does it should be much less of a problem. □

SEE PROGRAM LISTING ON PAGE 142

NEXT MONTH: Customizing the Commodore 64/128 Character Set—How to create your own text characters, and how to incorporate text characters into high-resolution graphics programs.

CADET'S COLUMN

Buying, Interfacing, and Operating a Printer

By Cheryl Peterson

Ah! New Year's Resolution time, folks. Are we all resolved to learn to use our computers more effectively? I'm certainly going to try to pick up a few new tricks this year. My educational endeavors will probably focus on the C-128 and Amiga computers, but I'll still be fiddling around with my 64. Since Commodore users catch on fast, I've got to hustle to stay at least one step ahead of you.

This month I'll focus on printers; how to choose one, and what to do with it after you've got it. Those of you who already have a printer, stick around. We've got something for you, too. We'll take a look at printer control codes, ASCII lookup tables, and DIP switches. Although it may sound a little complicated, interfacing a printer to a Commodore computer isn't so bad. And once you get the hang of it, you can do some really amazing things.

CHOOSING THE RIGHT PRINTER

Because you could end up spending $500 or more by the time you're really happy with your printer, it's a purchase you should consider carefully. As with anything you buy for your computer, you need to make sure your prospective buy works with the software and other peripherals you already have. If the printer you're considering does everything but make peanut butter and doesn't work with your word processor or graphics package, keep looking. If you decide to get that printer anyway, you'll have to buy new software.

So before you start shopping, make a list of the programs you have and the printers that work with them. If you want to use *Print Shop*, for instance, there is a large list of printers and interfaces that will work, but Broderbund recommends non-Commodore printers because the printouts look better. Some programs (*Fontmaster* is one) don't work with Commodore printers. Some graphics packages work better with Epson printers than with Commodore. The best way to be sure is to buy from a store where you can check the printouts to be sure you're satisfied.

Also keep in mind what you need to do with the printer. There are many different types of printers, but I'll divide them into two categories, printers that do graphics and printers that create typewriter quality (TQ) output. TQ printers create a page that is hard to differentiate from one created with a typewriter. The nicer ones turn out print comparable to an IBM Selectric. The cheaper ones look cheap, but perfectly legible. These machines have a few drawbacks. They are either slow at printing or very expensive. And you get no graphics!

The graphics-capable printers come in varieties from dot matrix with ribbons to thermot dot matrix to laser printers that rival typesetting machines. I seriously doubt if any of you want to put a $2000-$4000 printer on your Commodore, and as far as I know the software to drive laser printers isn't yet available for us, so we'll stick to the standard dot matrix type. Some of these support a letter quality printing mode that is not as crisp as the TQ printers, but for most uses the difference isn't worth mentioning. Generally speaking, dot matrix printers are faster than TQ printers, even in their letter quality mode.

POINTS TO CONSIDER WHEN BUYING A PRINTER

1. What software do you use? Want to use?
2. Do you need graphics or typewriter quality? Do you need letter quality printing?
3. Do you want color?
4. Do you need speed? Quiet?
5. How much money do you want to spend?
6. Commodore or third party? Does it require an interface?
7. Cost of ribbons, replacement parts like printheads or alternate printwheels.
8. Tractor feed or friction feed or both? Does tractor feed cost extra?
9. Serial or parallel communication? Both?

Most printers offer friction feed or tractor feed to get the paper in front of the printhead. I personally prefer tractor feed, because I print multipage documents and I hate to keep putting in new sheets of paper. Each page must be inserted and aligned individually with a friction feed printer. This is a necessary consideration only if the software you use doesn't have a "pause at end of page" feature. Otherwise, it's just a matter of convenience. Almost all printer manufacturers offer tractor feed

as an option, though sometimes it costs extra.

Not all printers work with the Commodore. In fact, most need some kind of interface because the Commodore computers use PETASCII instead of the standard ASCII (American Standard Code for Information Interchange) used by other computer and printer manufacturers. Unless you buy a Commodore printer (or one with a built-in Commodore interface), you'll have to pay from $50-$125 for an interface cable to run from your computer to the printer (see below).

Also consider whether or not you plan to move up to a different computer later on (or already own another computer). Most computers use an RS-232C connector or a Centronics parallel connector to interact with the outside world. Commodore's serial connectors are nonstandard and you may have a hard time getting a Commodore-compatible printer to work with another computer. If you face this problem, I'd recommend looking for a dual interface printer or a Centronics printer and a third party serial to parallel interface. There are Commodore-to-RS-232 interfaces being marketed, but they are less plentiful and offer a more limited variety.

Before I get into the nitty gritty of interfacing printers with the Commodore, I want to recommend a couple of articles that have appeared in *Ahoy!* in the past: Tom Benford's article on choosing a printer in the December '84 issue and Morton Kevelson's three-part series on printer interfacing beginning in that same issue and continuing in February and March '85. *Ahoy!* has run many articles on getting the most from graphics programs and the most popular printers.

We haven't done anything on getting to the fancy print styles that can be used in text printing: things like near letter quality, boldface, doublestrike, alternate pitch and line spacing, super- and subscript, expanded and compressed characters, italic printing, and international character sets. Most of these are supported by the more popular third party dot matrix printers. TQ printers support many of these, but expanded, compressed, and italic print aren't usually possible. Commodore printers may also have some of these features.

Rather than be too specific and limit our discussion to only some printers, I'm going to explain the general principles involved in communication between printers and computers. You should be able to apply this information to whatever model you use.

INTERFACING NICETIES

ASCII is a way of representing all the commonly used typing characters with numbers. These numbers are what is sent along the cable between a computer and printer. The computer converts the numbers back into letters and prints them. Special characters are used to represent things like tabs, carriage returns, linefeeds, and other printhead positioning commands. These characters are all part of the standard established years ago. You can find a modified version of the ASCII code list in the *Programmer's Reference Guide* or your *Commodore 64 User's Guide.* Commodore chose to redesignate some of the code in order to facilitate graphics usage.

In addition to these characters, each printer company has chosen certain character strings to recognize as commands that cause the printer to switch printing modes. Getting an Epson printer to switch from 10 characters per inch (CPI) to 12 requires sending an escape (ESC) character followed by an M. Frequently printer manufacturers use the ESC to designate that the characters that follow are a command. Have you heard computer users talking about sending escape or control codes to their printers? Perhaps your word processor's documentation mentions sending "special" codes to access alternate print styles? This is what they mean.

In some printer manuals, these characters may be represented by their CHR$ codes. The reason for this is that many printer manuals expect the user to be sending these codes using a BASIC program. For instance, a PRINT CHR$(27)"M" could be used to send the 12 CPI code to the printer. Of course, with the Commodore you'd have to open a channel to the printer first. Somewhere in almost every printer manual, there is a table that shows the codes needed to get that particular printer to turn on the fancy footwork. Sometimes that's all you need.

With many application programs (word processors, especially) it's not that simple. If the program offers imbedded print codes that will automatically turn on fancy

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features for you, you may not need to use the CHR$ codes. But usually, these codes are optimized for certain printers at the expense of using them on others. For instance, one word processor I have claims to let the user switch from 10 to 12 CPI just by imbedding a special character (created by holding down the C= key and another). This may work with other setups, but for my Epson RX-80 and Cardco +G interface it did not. While it did recalculate the line length so that it put more than 80 characters on each line it didn't switch the pitch.

Instead, another special character that sent the CHR$ value of the next character to the printer had to be used to imbed an ESC in the text, and the ESC had to be followed by an M. Using this roundabout method, it was possible to access most of the Epson's neatest features. It was not, however, convenient to do so. This is one reason that I recommend checking out how the software you have will work with the printer you are interested in buying. Since most printers use a similar scheme of operation, you'll either have to learn the codes yourself or buy software optimized for your printer.

If you buy a printer that has a letter quality mode, you can be sure that your word processor won't have a built-in command to turn on letter quality. You'll have to figure out how to send the proper codes. I have such a printer and it took me two days to get the letter quality mode on it working. The Mannesmann Tally 160L needs an ESC followed by a [, a 1 and a y to turn on word processing mode, then an ESC[4y to turn on 10 CPI letter quality mode. An ESC[5y is used to turn on 12 CPI letter quality.

Though it sounds easy, reading the printer manual for the MT160L did nothing but confuse me. The authors describe the process in terms of hexadecimal values for the ASCII codes and refer the user to a cryptic table on the inside of the back cover. That's why it took two days to figure it out! Fortunately, the software I use has a printer file contained on the disk. Once the correct codes are entered into the file, it will remember them and use them each time it prints a file. I have two different printer files —one for fast printing, the other for letter quality.

Normally the Commodore's reassigned ASCII values must be translated into codes that the printer can understand in order for it to print the graphics. Intelligent interfaces do this translation, unless a special code is sent that switches them off. When working in text mode it is sometimes better to turn the graphics off altogether. Sometimes this can be done by using an internal switch.

Usually a group of DIP (Dual Inline Position) switches have to be set before the interface is used. These switches allow the interface to be used with a variety of printers, even though each printer is different. These switches may control whether a linefeed is automatically generated with a carriage return, whether the interface can be turned off by the software in the Commodore (transparent mode), and whether the printer is device four or five.

Many printers also have such switches inside. In order for interface, printer, and Commodore to work together, all the switches must be set correctly. For instance, if the printer's auto-linefeed is turned on, the auto-linefeed in the interface is turned on, and the software you are using does an auto-linefeed with each carriage return, you'll get a triple-spaced document. Which is fine, if you want a triple-spaced document. Otherwise, you'll need to turn some of those linefeeds off.

Of course, by buying a Commodore printer or one with a built-in interface, you avoid many of these problems. Again, if you are really struggling with interfacing difficulties, I'd suggest contacting your local user group. You may find someone there who's gone through the same trials.

MAYBE I CAN HELP

Although it is difficult to give advice long distance, I can be found on Viewtron. Leave me a message in the For Starters SIG and I'll try to help you figure out what's wrong. If you've heard of a new printer and aren't sure about how well it works, you might leave a message asking if anyone else has experience with that brand. I'll be happy to give help in any areas you may be having trouble with, so drop me a line. My user ID is 266399CCP. I can also be found hanging around in Viewtron's CB section under the handle Cherp! Hope to see you there. ☐

Next month in *Cadet's Column*: We'll learn a few lessons about structured programming by sprucing up some sloppy BASIC. Also: how computerphobic are you?



ALARM CLOCK



For the C-64

By Tony St. Clair

Alarm Clock is an interrupt-driven utility which uses the C-64 time-of-day (TOD) clock to display the current time and alarm at some predetermined time. When run, the program asks the user to enter the current time. Either military or standard format can be used. If the standard format is used, the program will prompt for "am or pm" after entering the hour.

After entering the current time, the alarm time is entered in the same manner. When the current time reaches the time set for the alarm, the border will flash red and an audible alarm is produced. Two options are included in the program: 1) The audible alarm can be defeated, and 2) The present time can be continuously displayed in the upper right corner; or, to avoid any interference while entering BASIC statements on the first line, it can be disabled. In either case the alarm function will still be active.

The program works as follows. First, the top-of-BASIC pointer is lowered by 512 bytes to make room for the machine language (ML) portion of the program which is POKEd into memory in the read-data loop. In this manner the alarm clock can be active while other BASIC programs are in memory. Also, none of the free RAM at location 49152 is used, so that other BASIC utilities that may be resident will not be disturbed. The ML routine changes the IRQ vector so that 60 times a second the TOD clock is read, compared to the alarm time, and, optionally, written to the screen. If it is found that the current time matches the alarm time the alarm sequence is initiated. Every half-second the border will begin to alternate between red and the original border color. During this time the border color cannot be changed using the normal POKE command. (The IRQ will change it right back.) If so indicated, a tone will be heard with each flash of the border.

Since this program uses the TOD clock and not the jiffy clock, there are some advantages. Tape saves and loads will not interfere with the TOD clock (the screen display will be temporarily halted but will be updated at the completion of the save/load). Even a cold reset (SYS 64738) will not alter the TOD registers. (The IRQ vector will, however, be returned to normal.) Also, the TOD clock is automatically kept in the hour:minute:second format that is easy to understand, as opposed to the obscure jiffy system.

The following memory locations, i.e. constants in the Data statements, can be changed to provide different effects during program operation:

Enable/Disable routine, SYS	40449
Color of flash, 0-15	40708
Rate of flash, 0-255	40699,40736
Alarm hour, Binary Coded Decimal	40737
Alarm minute, Binary Coded Decimal	40738
Time display flag, 0=No	40739
Audio level, 0-15	40680
Note frequency (Lo-byte), 0-255	40625
Note frequency (Hi-byte), 0-255	40630
Waveform, 17, 33, or 129	40645

Some of these locations may be changed at any time; others may only be altered while the alarm sequence is not activated. ☐

SEE PROGRAM LISTING ON PAGE 143

COMMODARES
PROGRAMMING CHALLENGES

By Dale Rupert

Each month, we'll present several challenges designed to stimulate your synapses and toggle the bits in your cerebral random access memory. We invite you to send your solutions to:

Commodares, c/o *Ahoy!*
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We will print and discuss the cleverest, simplest, shortest, most interesting and/or most unusual solutions. Be sure to identify the *name* and *number* of the problems you are solving. Also show sample runs if possible, where appropriate. Be sure to tell what makes your solutions unique or interesting, if they are.

Programs on diskette are welcome, but they must be accompanied by listings. You must enclose a stamped, self-addressed envelope if you want any of your materials returned. Solutions received by the middle of the month shown on the magazine cover are most likely to be discussed, but you may send solutions and comments any time. Your original programming problems, suggestions, and ideas are equally welcome. The best ones will become *Commodares*!

PROBLEM #25-1: CHARACTER SPIRAL

This problem was submitted by Necah Buyukdura of Ankara, Turkey. Consider 25 adjacent columns and the 25 rows of the screen forming a 625-character square. Write a program which fills the blank square with 625 characters beginning in the center of the square and progressing in a counter-clockwise direction, like a winding spiral. The program should then unwind the spiral by filling the square with different characters or spaces, and the whole process is repeated. Can you come up with the fastest BASIC solution?

PROBLEM #25-2: DANDY DELETION

This problem was submitted by Jim Speers (Niles, MI) and can be approached similarly to his REM Remover discussed this month. The user specifies a low and a high line number. Write a subprogram beginning at line 60000 which deletes all program lines within those limits.

PROBLEM #25-3: COLOR CRITERIA

Solve this useful one proposed by Steven M. Steckler (Columbia, MD). When this program is run, the user types "RED, WHITE, BLUE", for example, to select the border, background, and text colors on the monitor.

PROBLEM #25-4: CENTRAL LOCATOR

My word processor has a text centering function which is activated before the line of text to be centered is typed. The cursor is at the midpoint of the line initially. Here's what it looks like when the word "Test" is typed (the cursor is indicated by "□"):

□
T□
Te□
Tes□
Test□

The first letter appears at the cursor's initial position and the cursor moves one space to the right. The second letter appears where the first letter was, the first letter is pushed to the left, and the cursor stays where it was. This process is repeated. The odd numbered characters replace the cursor and the cursor moves one space to the right. The even numbered characters shove all the text on the line one space to the left and the cursor doesn't move. Can you program this function?

This month we will look at readers' solutions to the September 1985 *Commodares. Problem #21-1: Geometry Fun*, proposed by Phil MacLean (Columbus, OH), brought numerous responses. The problem involved determining whether three specified points formed a straight line or not. If the three points are colinear, the program tells which of the three points is between the other two.

The solution involved not only some analytic geometry but some sorting as well. Most readers used the straightforward procedure of calculating the slopes of the lines between points one and two and between points two and three. If the slopes are equal (within accuracy limits of the computer), the three points are collinear. One complication is the fact that a vertical line has an undefined slope since the horizontal coordinates of the three points are equal.

The program listed below takes a more unusual approach.

```
1 REM
2 REM COMMODARE #21-1 : GEOMETRY FUN
3 REM SOLUTION BY JOYCE AND B.A. ZIDOVEC
4 A$="COLLINEAR POINTS!"
5 P$="POINT #":P1$=" LIES BETWEEN POINTS
 "
10 PRINT CHR$(147):FORI=1TO3:PRINT"PAIR
```

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```
(X,Y) #"I:INPUTX(I),Y(I):NEXT
15 S(1)=SQR((X(1)-X(2))^2+(Y(1)-Y(2))^2)
16 S(2)=SQR((X(2)-X(3))^2+(Y(2)-Y(3))^2)
17 S(3)=SQR((X(3)-X(1))^2+(Y(3)-Y(1))^2)
20 T1=X(1)*Y(2)+X(2)*Y(3)+X(3)*Y(1)
21 T2=X(1)*Y(3)+X(2)*Y(1)+X(3)*Y(2)
25 IF T1-T2 THEN PRINT "NOT "A$:GOTO 70
30 PRINT A$
40 IFS(3)>S(1)ANDS(3)>S(2)THENPRINTP$"2"
P1$"1 & 3":GOTO 70
50 IFS(2)>S(1)ANDS(2)>S(3)THENPRINTP$"1"
P1$"2 & 3":GOTO 70
60 IFS(1)>S(2)ANDS(1)>S(3)THENPRINTP$"3"
P1$"1 & 2":GOTO 70
65 PRINT"TWO OR MORE POINTS ARE IDENTICA
L"
70 WAIT 198,1:GOTO 10
```

This program from Joyce and B. A. Zidovac (Kitchener, ONT) uses a method which Wylie A. Smith (Annapolis, MD) refers to as "The Surveyor's Method" based on Green's Theorem. The quantity (T1-T2) in line 25 is zero if the three points are collinear. Otherwise it is non-zero.

Lines 15 through 17 of their program calculate the lengths of the line segments between each pair of points. For three collinear points, the longest line segment is between the two outside points. The point which is between the other two shares the two shorter line segments. Lines 40 through 60 decide which point is in the middle. Line 70 waits until a key is pressed at which time execution resumes at line 10. The key is actually used by the program, so don't press the <RETURN> key to continue. Your next keystroke should be the next X coordinate to be entered.

Wylie A. Smith mentioned that this method is applicable to any number of points. He also said that the value of (T1-T2) can be used to find the area of the polygon defined by non-collinear points. The area is simply the absolute value of (T1-T2) divided by two. You could easily modify the program to display the area. If you are interested in the general method of determinants for finding the area and even the direction of travel around an N-sided polygon, send me a stamped envelope with your request.

Problem #21-2: Logical Fun submitted by Michael Marron (Stony Brook, NY) was fun for quite a few reader. The solution from Frank T. Smith (Wilmington, DE) is representative of the majority of the solutions received.

```
1 REM
2 REM COMMODARE #21-2 : LOGICAL FUN
3 REM SOLUTION BY FRANK T. SMITH
4 REM
10 FOR S=1 TO 2
20 IF S=1 THEN PRINT"STATEMENT #1 IS TRU
E"
30 IF S=2 THEN PRINT"STATEMENT #1 IS FAL
SE"
40 FOR A=65 TO 95 STEP 10
50 FOR B=65 TO 95 STEP 10
60 FOR C=65 TO 95 STEP 10
70 FOR D=65 TO 95 STEP 10
120 IF A=95 AND C<>65 THEN 1000
130 IF C=75 AND A<>65 THEN 1000
140 IF A<=D THEN 1000
150 IF B<>95 AND A<>75 THEN 1000
160 IF C=85 AND D=65 THEN 1000
170 IF C<>95 AND D<>85 THEN 1000
180 IF B<>85 AND D=85 THEN 1000
190 T=0
200 IF A=B OR A=C OR A=D OR B=C OR B=D O
R C=D THEN T=1
210 IF S=1 AND T=1 THEN 1000
220 IF S=2 AND T=0 THEN 1000
230 PRINT "AL:"A;" BETTY:"B;" CONNIE:"C;
" DAN:"D
1000 NEXTD: NEXTC: NEXTB: NEXTA: NEXTS
```

Frank's program combines the two parts of the problem. The first statement that all grades must be different is true for part one and false for part two. Several readers correctly pointed out that there are many solutions unless we assume that the only valid grades are 65, 75, 85, and 96. Lines 40 through 70 generate all possible combinations of those four grades. Lines 120 through

180 correspond to conditions 2 through 8 of the original problem. Line 200 determines whether any of the grades are the same or not.

Whenever the conditions in any statement (lines 120 - 180) are met, the program branches to line 1000 since the current grades do not meet the requirement in the problem. For example, statement 2 said that if Al (A) gets a 95, then Connie (C) will get a 65. Line 120 of the program sees if the current values of A and C meet that stipulation. If A equals 95 but C does not equal 65, then that particular combination of grades is not valid. The program branches to line 1000 to get the next set of grades.

Only when all conditions are met does the program reach line 230 which prints out the names and their corresponding grades. There is one correct solution for all grades being different:

Al = 75 Betty = 85 Connie = 95 Dan = 65

If we assume that the first statement is false, hence "We will all get different marks" is a false statement, there are five solutions:

Al	Betty	Connie	Dan
75	65	95	65
75	75	95	65
75	95	95	65
85	95	95	65
85	95	95	75

Most readers sent solutions that included the single solution listed above as part of this second set of solutions.

Several readers used a slightly different way of approaching this problem. As an example, consider rule 7: "If Connie doesn't get a 95, then Dan will get an 85." Rather than stating

```
IF C<>95 AND D<>85 THEN ... (skip
invalid values)
```

some people preferred

```
IF C<>95 AND NOT(D=85) THEN ... (skip
invalid values)
```

In other words, if the first condition is valid but the second condition is not, the statement as a whole is invalid. Obviously both statements listed above give identical results. Use the form that is more natural for you.

Extra credit goes to Frank T. Smith, Wallace Leeker (Lemay, MO), Chris Roseman (Silver Spring, MD), David Hoffner (Brooklyn, NY), and Jim Speers (Niles, MI). These readers stated that either conditions 2, 3, 4, and 6 or conditions 2, 3, 6, and 8 can be omitted and still give the same solutions. Wallace Leeker and the proposer Michael Marron were the only two to list both sets of extraneous conditions. The other readers listed only one. There were no exotic methods revealed for solving this bonus problem. Apparently everyone simply replaced

groups of statements with REM statements until the proper combination of unneeded statements was found.

The biggest response this month was for *Problem #21-3: Decimal Columns* proposed by E. Harvey Hammett (Houston, TX). The program below was adapted from the solutions of Matt Shapiro and Ken Karow (unfortunately their addresses were on their envelopes, not on their listings; the envelopes were discarded).

```
1 REM
2 REM COMMODARE #22-3 : DECIMAL COLUMNS
3 REM SUGGESTED BY KEN KAROW
4 REM        AND BY MATT SHAPIRO
5 REM
6 SP$="                                    "
10 DC=8 :REM  DECIMAL COLUMN (1 TO 30)
20 FOR I=1 TO 5:READ N:GOSUB 1000
30 NEXT I : END
100 DATA 12.5,-134.56,-.0026,23,1.234
999 REM +-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-
1000 F$=STR$(N):FOR L=1 TO LEN(F$)
1010 C$=MID$(F$,L,1):IF C$<>"." AND C$<>
"E" THEN NEXT L
1020 PRINT LEFT$(SP$,DC-L)+F$:RETURN
2000 REM -=-CHANGE N TO F$ IN 20:DELETE
F$=STR$(N) IN LINE 1000 TO PRINT
2010 REM   SCI. NOTATION AS DECIMAL
```

Line 10 allows the programmer to specify the column on the screen or the printer at which the decimal points should be aligned. The three-line subroutine at lines 1000 to 1020 converts the numerical value in N into a string value. The decimal point or the exponential "E" is located in line 1010. The proper number of spaces and then the number are printed in line 1020. This version of the program displays numbers which are between −0.01 and 0.01 in their scientific notation format, e.g. 2E−3 instead of 0.002. If you prefer to keep the number in the same form as it is entered, change the N in line 20 to F$ and delete the F$=STR$(N) in line 1000. Many other readers sent very similar programs and procedures.

To send the output to a printer instead of the screen, simply add line 7:

```
7 OPEN 4,4
```

and change the PRINT in line 1020 to PRINT#4.

The shortest BASIC solution to *Problem #21-4: REM Remover* was written by Don French (Minneapolis, MN). The problem proposed by Jim Speers (Niles, MI) was to append a routine onto a main program which would remove all program lines which begin with either a REM statement of a semicolon. Don's solution is listed below.

```
1 REM
2 REM COMMODARE #21-4 : REM REMOVER
3 REM SOLUTION BY DON FRENCH
4 REM
55000 J=43:POKE631,19:POKE632,13:POKE633
,13:PRINT"[CLEAR][DOWN]GOTO55000"
55003 IFK=58ORK=143THENPRINT"[HOME]";STR
$(PEEK(J+2)+PEEK(J+3)*256):POKE198,3:END
55005 J=PEEK(J)+PEEK(J+1)*256:K=PEEK(J+4
):IFJ>0THEN55003
```

Most of the solutions to this problem were similar to Don's approach. He uses the "dynamic keyboard" technique. Characters are POKEd into the keyboard buffer during execution of the program. When the program ends, those keystrokes are executed by the computer just as if they had been typed directly. (Refer to this month's *Rupert Report* for another example using this technique.) Typically the keystrokes cause the program to run again, after some onscreen editing features have been utilized.

Specifically, line 55000 puts the <HOME> and two <RETURN> characters (characters 19 and 13) into the keyboard buffer. It also clears the screen, moves the cursor down to line 2 on the screen, and prints "GOTO 55000". Line 55003 looks at the first character in the program line to see if it is a semicolon (character 58) or a REM statement token (character 143). If so, the cursor is HOMEd and the line number of that line is determined and printed on the screen. The value three is put into the keyboard buffer counter, and the program ends.

The computer executes the three keystrokes it finds in the keyboard buffer. It moves the cursor to the top cor-

ner of the screen and behaves as if the <RETURN> key is pressed. Consequently the program line corresponding to the line number on the screen is deleted just as if you had typed a line number, then pressed <RETURN> to delete that line.

Actually K equals zero on the first time through this subprogram so line 55003 is bypassed. Line 55005 calculates the memory location of the first program line and stores it in J. The first two bytes starting at location J are the pointer to the start of the next program line. The bytes at location J+2 and J+3 are the line number. The first character in that line is stored in location J+4. K is now given the value of the first character in the line.

If the end of the program has been reached, the next-line address in J will equal zero. In that case, the program ends. If J does not equal zero, the program branches back to line 55003 where the value of K is tested.

This program starts back at the beginning of the main program every time one line is deleted. Some readers sent solutions which kept track of the last line deleted. Theoretically they should be faster than the program above. On the other hand, Don's program is fast enough to be quite impressive.

Jim Speers uses a similar program during debugging. Since a line beginning with a colon still functions properly, Jim adds trace statements to print out variables or to halt the execution to his program but precedes them with a semicolon. Then when debugging is finished, he types RUN55000 to clean up the program. Normally you should load this utility first, then type your program to be debugged. Alternately you may load the main program, then type or merge the REM Remover utility.

Congratulations and thanks to the many others with solutions to these *Commodares*. People with valid programs this month who were not mentioned earlier include the following:

Richard Pohland (Pittsford, NY)
Don Ackerman (Grass Lake, MI)
Paul Mather (Warminster, ONT)
David Butcher (Morgantown, WV)
Ross Parlette (Sunnyvale, CA)
Brian Wilcox (New Britain, CT)
David Wright (New Britain, CT)
Kenneth Hill (Kansas City, MO)
Steven Steckler (Columbia, MD)
Larry Anderson (San Andreas, CA)
Ron Barnhouse (Zanesville, OH)
Eric Biberhofer (Dundas, ONT)
Gerald Pothier (Yarmouth City, NS)
A. D. MacDonald (Millgrove, ONT)
Chuck Slotter (Philadelphia, PA)
James E. Killman (Memphis, TN)
Dennis Robertson (N. Pt. Richey, FL)
David Rasnake (New Port Richey, FL)
Ed Polyberne (Bricktown, NJ)
James Borden (Carlisle, PA)
John R. Prager (Bay City, MI)
Mark Bearden (Steele, AL)
Ron Weiner (Levittown, PA)
Bill Binder (Northville, MI)
Russell Prater (Parker, FL)
Chris Barth (Clinton, NJ)
Doug Olney (Coventry, RI)
Fred Theilig (Riverside, RI)
Rick Tyhurst (Ridgecrest, CA)
Jeffrey Mantei (Anderson, IN)
Linda C. Garcia (Fontana, CA)
Maurice Tift (Albany, GA)
Jim Johnston (Haskell, TX)
Paul DeLuca (Bradford, MA)
Thomson Fung (San Diego, CA)
Brian Wilcox (Benton, KY)
Steven G. Eason (Benton, KY)
Todd Hauser (Bicknell, IN)

And last but certainly not least, John Immarino (Hackensack, NJ).

One final tidbit sent by Jim Speers. What BASIC keyword will function as intended even when misspelled? Keep those solutions coming! ☐

TIPS AHOY!

Compiled by Michael Davila

C-64 WITH C-128 KEYS

The Commodore 128 has a handy numeric keypad. Unfortunately, it does not function in 64 mode. With *Keypad Enable,* the numeric keypad and the four cursor movement keys are enabled. This utility works by intercepting the key code from the numeric keypad and then translating it to the same key code for the main set of numeric and cursor keys.

```
100 REM* C-128 (64 MODE) KEYPAD ENABLE *
110 REM       *  BY PAUL DELEO *
120 B=828
130 READ A$:A=VAL(A$):POKE B,A:B=B+1:C=C
+A:IF B=974 THEN B=B+1:GOTO 130
140 IF B<>989 THEN 130
150 IFC=18512 THEN SYS976:PRINT"[CLEAR]N
UMERIC KEYPAD BY PAUL DELEO <<ENABLED>>"
:NEW
160 PRINT "[CLEAR]ERROR IN DATA STATEMEN
TS! PLEASE CHECK!":END
500 DATA 169,3,72,169,75,72,8,72,165,197
,72,72,76,49,234,120,160,,165,203,201,64
510 DATA 208,88,169,255,141,,220,140,47,
208,173,1,220,201,255,240,73,134,197,169
520 DATA 254,72,162,8,141,47,208,173,1,2
20,205,1,220,208,248,74,176,9,72,185,183
530 DATA 3,240,2,133,203,104,200,202,208
,240,104,56,42,192,23,144,219,165,203
540 DATA 201,64,240,26,162,129,160,,144,
8,41,127,133,203,162,194,160,1,169,235
550 DATA 140,141,2,134,245,133,246,32,22
4,234,169,255,141,47,208,32,66,235,76
560 DATA 129,234,,27,16,,59,11,24,56,,40
,43,,1,19,32,8,,35,44,135,7,130,2,,120
570 DATA 169,60,141,20,3,169,3,141,21,3,
88,96
```

The keypad and cursor keys can be deactivated by pressing the RUN/STOP-RESTORE keys. To reactivate, type SYS 976.

—Paul Deleo
Troy, MI

DOUBLE SPACING

Here's a short utility for the VIC 20 and C-64 that I've found very useful when modifying a program. What this utility does is provide you with a blank line between lines of text, thereby making a listing easier to read and/or modify. It can be disabled with the RUN/STOP-RESTORE combination. A SYS to the starting address, which can be relocated, will reactivate Double Spacing. In brief, this utility wedges into the CHROUT routine of the Kernal, which will output a character to the current output channel (usually the screen), and every time a carriage return is to be output, the machine language routine prints an additional carriage control character.

```
10 REM*PROGRAM-ID.          DOUBLE SPACING.
   REM*AUTHOR.              SHAWN K. SMITH
20 INPUT "PLACE AT[RIGHT][RIGHT]747[5"[L
EFT]"]";P
30 FORD=P TOP + 2 0:READY:POKED,Y:NEXT
50 DATA 162,000,160,001,142,038,003
60 DATA 140,039,003,096,201,013,208,003
70 DATA 032,001,000,076,001,000:X=P+11
90 POKEP+3,INT(X/256):POKEP+1,X-(PEEK(P+
3)*256):L=PEEK(806):H=PEEK(807)
100 POKEP+16,(L):POKEP+17,(H):POKEP+19,(
L):POKEP+20,(H):SYSP:LIST
120 **** RUN/STOP-RESTORE DISABLES ****
     ***SYS (PLACE-AT) REACTIVATES****
```

NOTE: It also works with a printer!

—Shawn K. Smith
Bronx, NY

BASIC TITLE SCREENS

Here's a tip for those of you who want to add a magnificent touch of style to your programs! It's a REM statement that can be appended anywhere in a BASIC program. It can be used to do nearly anything that a PRINT statement can. This is activated by the listing of the line that contains it.

```
1 REM ""[DEL][RVSON][s M][whatever else]
```

Where "WHATEVER ELSE" is in the line, you can put nearly anything that you wish. For example, to have the screen cleared when that line is listed, just place a reverse heart (shifted S) after the shifted M and press RETURN. Another example is

```
1 REM ""[DEL][RVSON][s M][s S]E[RVSOFF]T
HIS PROGRAM WAS WRITTEN BY JOHN DOE
```

This line will clear the screen, change the cursor color to white, and print the message without a line number. The contents of the REM have to appear as they do in a PRINT statement, just as SHIFT CLR/HOME appears as a reverse heart and CTRL 1 (WHT) appears as a reverse E in PRINT statements. As you can see, this routine can be used to make different sections of programs different colors, print a complete title screen when a program is listed, and endless other things to amaze

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–Kevin Brown
Anderson, IN

NO CRASH

I always buy *Ahoy!*, and I have always enjoyed the programs and other features in the magazine. But when it comes to using *Bug Repellent,* I feel very vulnerable. Many times I have mistyped SYS 49152. Most of the time the computer will lock up. This can become quite a nuisance, especially if I did not save the program that I was working on.

I abolished this problem with *No Crash.* What the program does is set an interrupt wedge which prints SYS 49152 in the upper right hand corner of the screen. To use the wedge, LOAD and RUN the program. The BASIC portion of the program will be erased. Next load the *Bug Repellent* as you normally would. To put the wedge to work, clear the screen and hit RETURN. *Bug Repellent* will then work as it normally does. Remember to clear the screen before you use the wedge by hitting the RUN/STOP-RESTORE combination.

```
5 PRINT"[CLEAR]"
10 FORX=828TO901:READA:POKEX,A:NEXT:SYS8
28:NEW
100 DATA120,169,73,141,20,3,169,3,141,21
,3,88
110 DATA96,169,58,141,31,4,169,19,141,32
,4,169
120 DATA25,141,33,4,169,19,141,34,4,169,
52,141
130 DATA35,4,169,57,141,36,4,169,49,141,
37,4
140 DATA169,53,141,38,4,169,50,141,39,4,
76,49
150 DATA234,120,169,49,141,20,3,169,234,
141,21,3
160 DATA88,96,0,0,0,0,0,0,0,0,0,0
```

–David Roscoe
Passaic, NJ

MOVE OVER MEMORY!

In many game programs it is necessary to move a large block of code from ROM to the hidden RAM below. This is usually done by the execution of a BASIC statement similar to the one that follows:

```
100 FOR J=40960 TO 49151: POKE J,PEEK(J)
: NEXT J
```

However, using this method takes over 30 seconds. The people at Commodore have included in the heart of BASIC ROM a mass move routine that you can use to do the same thing in less than two seconds. Let's say that

we wish to move the BASIC ROM to BASIC RAM. First we must POKE location 95 and 96 with the start address of BASIC ROM, which is 40960. Then we must POKE location 90 and 91 with the ending address or BASIC ROM plus 1, which is 49152. Then we must POKE location 88 and 89 with the ending address of the RAM area, which in this case is also 49152. Finally we must SYS to location 41919 to make the move. Once this is accomplished, POKE the memory to reveal the hidden copy of RAM and you are finished. Below is the full routine in the form of a BASIC program.

```
100 POKE 95,0: POKE 96,160 :REM ROM STAR
T ADDRESS
105 POKE 90,0: POKE 91,192 :REM ROM END
ADDRESS +1
110 POKE 88,0: POKE 89,192 :REM RAM END
ADDRESS +1
115 SYS 41919
```

—S.D. Betesh
Kingston, ONT

CURSED CURSOR

Positioning text on the screen can be very complicated, especially when using the cursor keys or the POKE statement. I wrote the following program to allow easy cursor positioning on the text screen. The variable A indicates where the machine language program will be stored. I used the cassette buffer (832), but the routine can be stored at other places in memory. To activate the routine, use the command SYS A,X,Y where A is the location of the routine in memory, X is the column (0-39), and Y is the row (0-24). The next character printed on the screen will be placed at the X and Y coordinates specified by the command.

```
10 A=832:FORI=ATOA+28:READJ:POKEI,J:NEXT
20 DATA 32,253,174,32,138,173,32,247,183
30 DATA 152,72,32,253,174,32,138,173,32
40 DATA 247,183,152,170,104,168,24,32
50 DATA 240,255,96
```

—Mike Hoyt
Richardson, TX

So you think you know it all? So do most of the programmers who submit to *Tips Ahoy!* Unfortunately, very few of them actually have what it takes to be published in these pages. We're serious when we say that we want only the *best* programming tips that the Commodore community has to offer--and we'd much rather run a shorter installment of *Tips Ahoy!* than print second rate material. If you're willing to risk the postage, be assured that financial remuneration is more than competitive by industry standards. Send your best to *Tips Ahoy!*, c/o Ion International Inc., 45 W. 34th St.—Suite 407, New York, NY 10001.

INFRARAID

An Error-Trapping Wedge for the C-64

By Timothy VanDeventer

A fact of life: bugs are unavoidable. They can creep into the darkest recesses of programs and, when everything seems to be running the smoothest, come out and make garbage of your labors. Assuming you are not immune to programming errors, *Infraraid* can help you find, and trap, pesky bugs.

TRAPPING *INSECTUS INTHEPROGRAMMUS*

Recently, while working on a BASIC calculator simulation program, I came across an interesting (read frustrating) problem with the way BASIC 2.0 handles errors. Or should I say, the way BASIC *doesn't* handle errors. My problem arose when I tried to do arithmetic operations on numbers that exceeded the maximally allowed limit that is stored by BASIC, which is approximately 1.7E+38. Any numbers larger than this limit would result in an ?OVERFLOW ERROR. An example is 1E+20 multiplied by 1E+25, which should result in 1E+45; instead, my program would give the dreaded ?OVERFLOW ERROR and crash.

One way around this, I thought, would be to convert my BASIC program into machine language (and lose the weeks of programming already spent). Another idea was to somehow modify BASIC to either handle larger numbers or, alternatively, trap the error within the program. My final solution was a synthesis of all three ideas: using machine language, modifying BASIC somewhat, *and* trapping the error within the program.

(Some of you may see an easy solution to this problem: namely, adding the exponents and comparing the sum with 38, the upper limit. However, for a calculator simulation program to be user friendly, it must allow for any size and type of number. Therefore the program would have to normalize the mantissa of a large number before adding the exponents. This would be a slow process in BASIC, and henceforth I came up with a better solution.)

IDENTIFYING *INSECTUS INTHEPROGRAMMUS*

It is essential to understand how errors are generated to be able to properly handle them. There are two potential sources for bugs. The type are within the program itself and are created by the programmer. These errors can be broken into two groups: syntax (or format) errors and logic errors. Syntax errors occur when the programmer breaks the rules of BASIC text syntax. What happens is that the BASIC interpreter comes across a character it cannot handle. Perhaps it was looking for a number and came across an ASCII letter. Another possibility is a spelling mistake in a command word. Syntax errors always generate a BASIC error message and, therefore, are usually easy to find. (I did say usually, didn't I?)

Logic errors sometimes, but not always, generate a BASIC error message and therefore are harder to track down. The most common logic error is when the program jumps to another section and, say, into the middle of a FOR-NEXT loop. The NEXT is encountered without a pending FOR and the program crashes. The SYNTAX of the program is correct, but the LOGIC is at fault —even though the error message given, ?NEXT WITHOUT FOR ERROR, might indicate to you a program syntax error. A logic error that doesn't crash the program, such as jumping to a wrong line, just won't do what you want it to, period.

The second type of bugs are not created by the programmer, but must nevertheless be handled properly to assure a smooth-running program. These can be divided into externally generated errors and system limitations. Externally generated errors can come from various sources, such as a file being used by the program, or directly from the user. The best way to handle inputs from any source is always to expect the unexpected. Make sure all data received is what the program requires before using it, and reject any garbage that might come across. In BASIC, I always use GET rather than INPUT, and always store data in a string variable and convert to a numeric variable as needed.

The problem I encountered in my calculator program is a sample of a system limitation. As you might guess, system limitations are the hardest potential source of problems to account for. In my case, I couldn't do arithmetic operations on large numbers simply because BASIC wouldn't allow me to. But yet I had to allow for any number the user could possibly enter. That didn't mean I *had* to do the calculation, merely that I had to allow for the user to attempt to do the calculation without crashing my program, if this makes sense to you. (It did to me!) Another limitation on any computer system is the amount of RAM the programmer has available. On the C-64, large array tables can quickly use up available memory. In the case of a hardware system limitation, you can either upgrade or find an alternative software solution.

Now that we know all the potential sources of bugs that can infest, I will show you my solution for finding and trapping these critters.

TABLE 1
Code numbers for BASIC errors

ER%=	:BASIC error message	ER%=	:BASIC error message
1	TOO MANY FILES	16	OUT OF MEMORY
2	FILE OPEN	17	UNDEF'D STATEMENT
3	FILE NOT OPEN	18	BAD SUBSCRIPT
4	FILE NOT FOUND	19	REDIM'D ARRAY
5	DEVICE NOT PRESENT	20	DIVISION BY ZERO
6	NOT INPUT FILE	21	ILLEGAL DIRECT
7	NOT OUTPUT FILE	22	TYPE MISMATCH
8	MISSING FILENAME	23	STRING TOO LONG
9	ILLEGAL DEVICE NUMBER	24	FILE DATA
10	NEXT WITHOUT FOR	25	FORMULA TOO COMPLEX
11	SYNTAX	26	CAN'T CONTINUE
12	RETURN WITHOUT GOSUB	27	UNDEF'D FUNCTION
13	OUT OF DATA	28	VERIFY
14	ILLEGAL QUANTITY	29	LOAD
15	OVERFLOW	30	BREAK

THE WEAPON AGAINST *INSECTUS INTHEPROGRAMMUS*

Infraraid is technically a BASIC error-trapping wedge. It is a 495-byte machine language program stored starting at 50176. Note that the Commodore DOS wedge is stored starting at 51200, and it and *Infraraid* can coexist. Also note that be-

TABLE 2
Values for Different TR% (Trap Variable) Configurations

High byte: 16 bit TR%: 0110 0000
Low byte: 0000 1111

Zeroes indicate unused bits. Values in these bits can be zero of one as they are not checked in this version of *Infraraid.*

SPECIFIC FUNCTIONS AND VALUES

Binary expanded	Decimal value	Function (to trap)
0000 0000 0000 0001	1	OVERFLOW ERROR
0000 0000 0000 0010	2	DIVISION BY ZERO ERROR
0000 0000 0000 0100	4	FILE NOT FOUND ERROR
0000 0000 0000 1000	8	DEVICE NOT PRESENT ERROR
0010 0000 0000 0000	32*256	STOP key interrupt
0100 0000 0000 0000	64*256	STORE/RESTORE key sequence

Note that any or all relevant bits may be set or clear at any time. Also, TR% may be changed anywhere in a BASIC program.

It must also be understood that TR% is only referenced by *Infraraid* when an error is generated. Therefore, if you wish to turn off the STOP key or the STOP/RESTORE key sequence at the beginning of a BASIC program, you must generate an error immediately after you set TR%. This next example will do this properly:

```
10 IF A=0 THEN A=1:LOAD "INFRARAID",8,1
15 SYS 50176
20 TR%=64*256+8+4+2+1:REM set STOP/REST
ORE and other trap bits
30 A=1/0:REM Generate error so INFRARAI
D can disable STOP/RESTORE
40 LN=your line number:REM put the line
number of your error routine here
50 EL%=LN+(LN>32767)*65536:REM This wil
l properly set EL% for any valid LN
```

cause the error routine vector at 768- 769 has to point to *Infraraid*, it is not relocatable.

To save *Infraraid* to tape or disk, type in the BASIC loader program and run it. I suggest entering the loader exactly as listed to allow my error checking routine to work properly. REM's may be deleted. As the loader runs it will print the line number of the current data line across the screen seven times, which corresponds to seven data numbers per line. If the loader comes across bad data (less than 0 or greater than 255) it will halt execution and tell you which line to examine. In this case, simply count the number of times the line number was printed and the next data item in that line is the problem. As an example, if the loader stops and prints the message BAD DATA IN LINE 310 and 310 was printed four times across the screen, the bad data is the fifth number in that line. The loader also calculates a checksum of all data (all the numbers are added together) and will tell you of a checksum error. In this case, first make sure the number in line 60 is 65731. PRINT CS will tell you the computed checksum. Then you will have to check all data individually. If BASIC crashes the loader with an ?OUT OF DATA ERROR, you missed some data somewhere. After the loader is all debugged and runs through it will ask you if you want the wedge saved to tape or disk.

Now that all prelim's are aside and you have a working version saved, let's find out what this software can do.

EXTERMINATING *INSECTUS INTHEPROGRAMMUS*

Infraraid is useful both in program development and as an error-trapping extension to BASIC 2.0. After loading, initiate *Infraraid* with SYS 50176. This causes several things to happen. First *Infraraid* sets the IERROR vector at 768-769 to point to itself and stores the original vector. Next a few variables must be created. ER% is used to store the code number BASIC uses to identify the error (see Table 1). TR% is a program-defined variable that specifies which errors to trap. It is also used to turn on or off the RUN/STOP key or the RUN/STOP RESTORE sequence (see Table 2). EL% is a third, program-defined variable used to specify which line in the BASIC program to jump to when a trapped error, referenced from TR%, occurs (see Table 3). Note that all three variables, whether used by a BASIC program or not, are created by *Infraraid.*

Probably the best way to learn how to use the Wedge is to do some examples. Load and activate *Infraraid* if not already done and, enter PRINT ER% in direct mode. If there is no current error condition you will get 128 as the result. (Although not technically an error, the READY prompt is vectored through the BASIC error routine and has the value of 128. This is the easiest way to verify that the Wedge is activated when in direct mode.) Cursor up to the READY prompt and hit RETURN to generate an ?OUT OF DATA ERROR, then enter PRINT ER%. ER% should be 13. I suggest experimenting in direct mode, generating various errors.

Infraraid alone, without setting any parameters in the variables, is a handy debugging tool. In direct mode, except for setting ER%, *Infraraid* is transparent, but in program mode when an error occurs it will clear the screen and display the line where execution stopped. Control is then passed to the BASIC error handler which prints the normal error message. In most cases, the last character read by BASIC will be displayed in white to highlight it from the rest of the line, which is displayed in the normal blue on blue.

To understand how this works we must know a little bit about how BASIC reads text. The CHARGET routine from 115 to 138 in page zero RAM is a short machine language routine that does the actual reading of program text and the vector TXTPTR at 122-123 is the address of the next text character. The important addresses to *Infraraid* are TXTPTR and another location, CURLIN, at 57-58, which is the current BASIC text line number. *Infraraid* uses CURLIN to find the text line and then prints the line character by character. If an address of a character matches that of TXTPTR, *Infraraid* changes the color of that character when printed. This is where the error occurred and BASIC stopped execution. Note that keywords are stored as one character, and if TXTPTR happens to point to it, the whole keyboard will be printed in white when expanded to ASCII characters.

Again, the best way to see this is to do some examples, such as

```
10 PRINT 10↑100
```

when run, *Infraraid* will clear the screen and print

```
10 PRINT 10↑100
?OVERFLOW ERROR IN 10
```

Continued on page 145

PROGRAM LISTINGS

Attention new *Ahoy!* readers! You must read the following information very carefully prior to typing in programs listed in *Ahoy!* Certain Commodore characters, commands, and strings of characters and commands will appear in a special format. Follow the instructions and listing guide on this page.

On the following pages you'll find several programs that you can enter on your Commodore computer. But before doing so, read this entire page carefully.

To insure clear reproductions, *Ahoy!*'s program listings are generated on a daisy wheel printer, incapable of printing the commands and graphic characters used in Commodore programs. These are therefore represented by various codes enclosed in brackets [ ]. For example: the SHIFT CLR/HOME command is represented onscreen by a heart . The code we use in our listings is [CLEAR]. The chart below lists all such codes which you'll encounter in our listings, except for one other special case.

The other special case is the COMMODORE and SHIFT characters. On the front of most keys are two symbols. The symbol on the left is obtained by pressing that key while holding down the COMMODORE key; the symbol on the right, by pressing that key while holding down the SHIFT key. COMMODORE and SHIFT characters are represented in our listings by a lower-case "s" or "c" followed by the symbol of the key you must hit. COMMODORE J, for example, is represented by [c J], and SHIFT J by [s J].

Additionally, any character that occurs more than two times in a row will be displayed by a coded listing. For example, [3 "[LEFT]"] would be 3 CuRSoR left commands in a row, [5 "[s EP]"] would be 5 SHIFTed English Pounds, and so on. Multiple blank spaces will be noted in similar fashion: e.g., 22 spaces as [22 " "].

Sometimes you'll find a program line that's too long for the computer to accept (C-64 lines are a maximum of 80 characters, or 2 screen lines long; VIC 20 lines, a maximum of 88 characters, or 4 screen lines). To enter these lines, refer to the *BASIC Command Abbreviations Appendix* in your User Manual.

On the next page you'll find our *Bug Repellent* programs for the VIC 20 and C-64. The version appropriate for your machine will help you proofread our programs after you type them. (Please note: the *Bug Repellent* line codes that follow each program line, in the whited-out area, should *not* be typed in. See the instructions preceding each program.)

Also on the following page you will find *Flankspeed*, our ML entry program, and instructions on its use. □

Call *Ahoy!* at 212-239-0855 with any problems.

When You See	It Means	You Type		You Will See
[CLEAR]	Screen Clear	SHIFT	CLR/HOME	
[HOME]	Home		CLR/HOME	
[UP]	Cursor Up	SHIFT	↑CRSR↓	
[DOWN]	Cursor Down		↑CRSR↓	
[LEFT]	Cursor Left	SHIFT	←CRSR→	
[RIGHT]	Cursor Right		←CRSR→	
[SS]	Shifted Space	SHIFT	Space	
[INSERT]	Insert	SHIFT	INST/DEL	
[DEL]	Delete		INST/DEL	
[RVSON]	Reverse On	CNTRL	9	
[RVSOFF]	Reverse Off	CNTRL	0	
[UPARROW]	Up Arrow		↑	
[BACKARROW]	Back Arrow		←	
[PI]	PI		π	
[EP]	English Pound		£	

When You See	It Means	You Type		You Will See
[BLACK]	Black	CNTRL	1	
[WHITE]	White	CNTRL	2	
[RED]	Red	CNTRL	3	
[CYAN]	Cyan	CNTRL	4	
[PURPLE]	Purple	CNTRL	5	
[GREEN]	Green	CNTRL	6	
[BLUE]	Blue	CNTRL	7	
[YELLOW]	Yellow	CNTRL	8	
[F1]	Function 1		F1	
[F2]	Function 2	SHIFT	F1	
[F3]	Function 3		F3	
[F4]	Function 4	SHIFT	F3	
[F5]	Function 5		F5	
[F6]	Function 6	SHIFT	F5	
[F7]	Function 7		F7	
[F8]	Function 8	SHIFT	F7	

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IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** This page and page 113 explain these codes and provide other essential information on entering ***Ahoy!*** programs. Read these pages **before** entering programs.

BUG REPELLENT

This program will let you debug any *Ahoy!* program. Follow instructions for VIC 20 (cassette or disk) or C-64.

VIC 20 VERSION

By Michael Kleinert and David Barron

For cassette: type in and save the *Bug Repellent* program, then type RUN 63000[RETURN]SYS 828[RETURN]. If you typed the program properly, it will generate a set of two-letter line codes that will match those listed to the right of the respective program lines.

Once you've got a working *Bug Repellent*, type in the program you wish to check. Save it and type the RUN and SYS commands listed above once again, then compare the line codes generated to those listed in the magazine. If you spot a discrepancy, a typing error exists in that line. Important: you must use exactly the same spacing as the program in the magazine. Due to memory limitations on the VIC, the VIC *Bug Repellent* will register an error if your spacing varies from what's printed.

You may type SYS 828 as many times as you wish, but if you use the cassette for anything, type RUN 63000 to restore the *Repellent*.

When your program has been disinfected you may delete all lines from 63000 on. (Be sure the program you type doesn't include lines above 63000!)

For disk: enter *Bug Repellent*, save it, and type RUN:NEW [RETURN]. Type in the program you wish to check, then SYS 828.

To pause the line codes listing, press SHIFT.

To send the list to the printer type OPEN 4,4:CMD 4:SYS 828[RETURN]. When the cursor comes back, type PRINT#4:CLOSE 4[RETURN].

```
·63000 FORX=828TO1023:READY:POKEX,Y:NEXT:END   AC
·63001 DATA169,0,133,63,133,64,165,43,133,251  JL
·63002 DATA165,44,133,252,160,0,132,254,32,228 DF
·63003 DATA3,234,177,251,208,3,76,208,3,230    OE
·63004 DATA251,208,2,230,252,169,244,160,3,32  OH
·63005 DATA30,203,160,0,177,251,170,230,251,20
 8                                             KO
·63006 DATA2,230,252,177,251,32,205,221,169,58 JJ
·63007 DATA32,210,255,169,0,133,253,230,254,32 OK
·63008 DATA228,3,234,165,253,160,0,170,177,251 LG
·63009 DATA201,32,240,6,138,113,251,69,254,170 BP
·63010 DATA138,133,253,177,251,208,226,165,253
 ,41                                           DD
·63011 DATA240,74,74,74,74,24,105,65,32,210    EK
·63012 DATA255,165,253,41,15,24,105,65,32,210  FO
·63013 DATA255,169,13,32,210,255,173,141,2,41  PK
·63014 DATA1,208,249,230,63,208,2,230,64,230   CB
·63015 DATA251,208,2,230,252,76,74,3,169,236   KH
·63016 DATA160,3,32,30,203,166,63,165,64,32    DP
·63017 DATA205,221,169,13,32,210,255,96,230,25
 1                                             EL
·63018 DATA208,2,230,252,96,0,76,73,78,69      OI
·63019 DATA83,58,32,0,76,73,78,69,32,35        FG
·63020 DATA32,0,0,0,0,0                        LE
```

C-64 VERSION

By Michael Kleinert and David Barron

Type in, SAVE, and RUN the *Bug Repellent*. Type NEW, then type in or LOAD the *Ahoy!* program you wish to check. When that's done, SAVE your program (don't RUN it!) and type SYS 49152 [RETURN].

To pause the listing depress and hold the SHIFT key.

Compare the codes your machine generates to the codes listed to the right of the respective program lines. If you spot a difference, an error exists in that line. Jot down the number of lines where contradictions occur, LIST each line, spot the errors, and correct them.

```
·5000 FORX=49152TO49488:READY:POKEX,Y:NEXT:END GJ
·5001 DATA32,161,192,165,43,133,251,165,44,133 DL
·5002 DATA252,160,0,132,254,32,37,193,234,177  DB
·5003 DATA251,208,3,76,138,192,230,251,208,2   OF
·5004 DATA230,252,76,43,192,76,73,78,69,32     KN
·5005 DATA35,32,0,169,35,160,192,32,30,171     CA
·5006 DATA160,0,177,251,170,230,251,208,2,230  CE
·5007 DATA252,177,251,32,205,189,169,58,32,210 JE
·5008 DATA255,169,0,133,253,230,254,32,37,193  CL
·5009 DATA234,165,253,160,0,76,13,193,133,253  NB
·5010 DATA177,251,208,237,165,253,41,240,74,74 MB
·5011 DATA74,74,24,105,65,32,210,255,165,253   EP
·5012 DATA41,15,24,105,65,32,210,255,169,13    GH
·5013 DATA32,220,192,230,63,208,2,230,64,230   AN
·5014 DATA251,208,2,230,252,76,11,192,169,153  NG
·5015 DATA160,192,32,30,171,166,63,165,64,76   BF
·5016 DATA231,192,96,76,73,78,69,83,58,32      EP
·5017 DATA0,169,247,160,192,32,30,171,169,3    PJ
·5018 DATA133,254,32,228,255,201,83,240,6,201  FK
·5019 DATA80,208,245,230,254,32,210,255,169,4  FL
·5020 DATA166,254,160,255,32,186,255,169,0,133 CL
·5021 DATA63,133,64,133,2,32,189,255,32,192    GC
·5022 DATA255,166,254,32,201,255,76,73,193,96  NN
·5023 DATA32,210,255,173,141,2,41,1,208,249    NH
·5024 DATA96,32,205,189,169,13,32,210,255,32   IM
·5025 DATA204,255,169,4,76,195,255,147,83,67   KC
·5026 DATA82,69,69,78,32,79,82,32,80,82        DC
·5027 DATA73,78,84,69,82,32,63,32,0,76         ML
·5028 DATA44,193,234,177,251,201,32,240,6,138  GN
·5029 DATA113,251,69,254,170,138,76,88,192,0   JK
·5030 DATA0,0,0,230,251,208,2,230,252,96       NA
·5031 DATA170,177,251,201,34,208,6,165,2,73    DM
·5032 DATA255,133,2,165,2,208,218,177,251,201  JA
·5033 DATA32,208,212,198,254,76,29,193,0,169   FM
·5034 DATA13,76,210,255,0,0,0                  PA
```

FLANKSPEED FOR THE C-64

By Gordon F. Wheat

Flankspeed will allow you to enter machine language *Ahoy!* programs without any mistakes. Once you have typed the program in, save it for future use. While entering an ML program with *Flankspeed* there is no need to enter spaces or hit the carriage return. This is all done automatically. If you make an error in a line a bell will ring and you will be asked to enter it again. To LOAD in a program Saved with *Flankspeed* use LOAD "name",1,1 for tape, or LOAD "name",8,1 for disk. The function keys may be used after the starting and ending addresses have been entered.

f1—SAVEs what you have entered so far.

f3—LOADs in a program worked on previously.

f5—To continue on a line you stopped on after LOADing in the previously saved work.

f7—Scans through the program to locate a particular line, or to find out where you stopped the last time you entered the program. f7 temporarily freezes the output as well.

```
·5 POKE53280,12:POKE53281,11                  LL
·6 PRINT"[CLEAR][c 8][RVSON][15" "]FLANKSPEED[
 15" "]";                                     ED
·10 PRINT"[RVSON][5" "]MISTAKEPROOF ML ENTRY P
 ROGRAM[6" "]"                                MC
·15 PRINT"[RVSON][9" "]CREATED BY G. F. WHEAT[
 9" "]"                                       DM
·20 PRINT"[RVSON][3" "]COPR. 1984, ION INTERNA
```

```
TIONAL INC.[3" "]"                                    DH
30 FORA=54272TO54296:POKEA,0:NEXT                     IM
40 POKE54272,4:POKE54273,48:POKE54277,0:POKE5
4278,249:POKE54296,15                                 NH
70 FORA=680TO699:READB:POKEA,B:NEXT                   KO
75 DATA169,251,166,253,164,254,32,216,255,96          HJ
76 DATA169,0,166,251,164,252,32,213,255,96            JB
80 B$="STARTING ADDRESS IN HEX":GOSUB2010:AD=
B:SR=B                                                HC
85 GOSUB2520:IFB=0THEN80                              FO
86 POKE251,T(4)+T(3)*16:POKE252,T(2)+T(1)*16          KE
90 B$="ENDING ADDRESS IN HEX":GOSUB2010:EN=B          IF
95 GOSUB2510:IFB=0THEN80                              FP
96 POKE254,T(2)+T(1)*16:B=T(4)+1+T(3)*16              MN
97 IFB>255THENB=B-255:POKE254,PEEK(254)+1             GE
98 POKE253,B:PRINT                                    HN
100 REM  GET HEX LINE                                 IL
110 GOSUB3010:PRINT": [c P][LEFT]";:FORA=0TO8         FG
120 FORB=0TO1:GOTO210                                 MD
125 NEXTB                                             ME
130 A%(A)=T(1)+T(0)*16:IFAD+A-1=ENTHEN310             LH
135 PRINT" [c P][LEFT]";                              IK
140 NEXTA:T=AD-(INT(AD/256)*256):PRINT" "             PD
150 FORA=0TO7:T=T+A%(A):IFT>255THENT=T-255            LK
160 NEXT                                              IA
170 IFA%(8)<>TTHENGOSUB1010:GOTO110                   FK
180 FORA=0TO7:POKEAD+A,A%(A):NEXT:AD=AD+8:GOT
O110                                                  MN
200 REM    GET HEX INPUT                              AB
210 GETA$:IFA$=""THEN210                              HO
211 IFA$=CHR$(20)THEN270                              GC
212 IFA$=CHR$(133)THEN4000                            MD
213 IFA$=CHR$(134)THEN4100                            KF
214 IFA$=CHR$(135)THENPRINT" ":GOTO4500               GE
215 IFA$=CHR$(136)THENPRINT" ":GOTO4700               BJ
220 IFA$>"@"ANDA$<"G"THENT(B)=ASC(A$)-55:GOTO
250                                                   GM
230 IFA$>"/"ANDA$<":"THENT(B)=ASC(A$)-48:GOTO
250                                                   LE
240 GOSUB1100:GOTO210                                 LL
250 PRINTA$"[c P][LEFT]";                             OA
260 GOTO125                                           CG
270 IFA>0THEN280                                      OP
272 A=-1:IFB=1THEN290                                 OB
274 GOTO140                                           CJ
280 IFB=0THENPRINTCHR$(20);CHR$(20);:A=A-1            HG
285 A=A-1                                             BE
290 PRINTCHR$(20);:GOTO140                            KH
300 REM LAST LINE                                     AD
310 PRINT" ":T=AD-(INT(AD/256)*256)                   GJ
320 FORB=0TOA-1:T=T+A%(B):IFT>255THENT=T-255          PL
330 NEXT                                              IA
340 IFA%(A)<>TTHENGOSUB1010:GOTO110                   KF
350 FORB=0TOA-1:POKEAD+B,A%(B):NEXT                   HN
360 PRINT:PRINT"YOU ARE FINISHED!":GOTO4000           ON
1000 REM BELL AND ERROR MESSAGES                      FL
1010 PRINT:PRINT"LINE ENTERED INCORRECTLY":PR
INT:GOTO1100                                          DH
1020 PRINT:PRINT"INPUT A 4 DIGIT HEX VALUE!":
GOTO1100                                              JA
1030 PRINT:PRINT"ENDING IS LESS THAN STARTING
!":B=0:GOTO1100                                       HD
1040 PRINT:PRINT"ADDRESS NOT WITHIN SPECIFIED
RANGE!":B=0:GOTO1100                                  AG
1050 PRINT:PRINT"NOT ZERO PAGE OR ROM!":B=0:G
OTO1100                                               KN
```

```
1060 PRINT"?ERROR IN SAVE":GOTO1100                   EI
1070 PRINT"?ERROR IN LOAD":GOTO1100                   GL
1080 PRINT:PRINT:PRINT"END OF ML AREA":PRINT          PG
1100 POKE54276,17:POKE54276,16:RETURN                 BH
1200 OPEN15,8,15:INPUT#15,A,A$:CLOSE15:PRINTA
$:RETURN                                              IM
2000 REM GET FOUR DIGIT HEX                           PC
2010 PRINT:PRINTB$;:INPUTT$                           GM
2020 IFLEN(T$)<>4THENGOSUB1020:GOTO2010               II
2040 FORA=1TO4:A$=MID$(T$,A,1):GOSUB2060:IFT(
A)=16THENGOSUB1020:GOTO2010                           AD
2050 NEXT:B=(T(1)*4096)+(T(2)*256)+(T(3)*16)+
T(4):RETURN                                           GF
2060 IFA$>"@"ANDA$<"G"THENT(A)=ASC(A$)-55:RET
URN                                                   EH
2070 IFA$>"/"ANDA$<":"THENT(A)=ASC(A$)-48:RET
URN                                                   KP
2080 T(A)=16:RETURN                                   NP
2500 REM ADRESS CHECK                                 LI
2510 IFAD>ENTHEN1030                                  MI
2515 IFB<SRORB>ENTHEN1040                             MG
2520 IFB<256OR(B>40960ANDB<49152)ORB>53247THE
N1050                                                 MI
2530 RETURN                                           IM
3000 REM ADDRESS TO HEX                               EB
3010 AC=AD:A=4096:GOSUB3070                           HG
3020 A=256:GOSUB3070                                  CE
3030 A=16:GOSUB3070                                   PN
3040 A=1:GOSUB3070                                    MJ
3060 RETURN                                           IM
3070 T=INT(AC/A):IFT>9THENA$=CHR$(T+55):GOTO3
090                                                   CJ
3080 A$=CHR$(T+48)                                    JP
3090 PRINTA$;:AC=AC-A*T:RETURN                        AC
4000 A$="**SAVE**":GOSUB4200                          AI
4050 OPEN1,T,1,A$:SYS680:CLOSE1                       LH
4060 IFST=0THENEND                                    EO
4070 GOSUB1060:IFT=8THENGOSUB1200                     FJ
4080 GOTO4000                                         FF
4100 A$="**LOAD**":GOSUB4200                          AB
4150 OPEN1,T,0,A$:SYS690:CLOSE1                       MF
4160 IFST=64THEN110                                   JH
4170 GOSUB1070:IFT=8THENGOSUB1200                     CM
4180 GOTO4100                                         FO
4200 PRINT" ":PRINTTAB(14)A$                          FG
4210 PRINT:A$="":INPUT"FILENAME";A$                   OM
4215 IFA$=""THEN4210                                  GF
4220 PRINT:PRINT"TAPE OR DISK?":PRINT                 DF
4230 GETB$:T=1:IFB$="D"THENT=8:A$="@0:"+A$:RE
TURN                                                  IG
4240 IFB$<>"T"THEN4230                                FN
4250 RETURN                                           IM
4500 B$="CONTINUE FROM ADDRESS":GOSUB2010:AD=
B                                                     DK
4510 GOSUB2515:IFB=0THEN4500                          MA
4520 PRINT:GOTO110                                    OI
4700 B$="BEGIN SCAN AT ADDRESS":GOSUB2010:AD=
B                                                     FH
4705 GOSUB2515:IFB=0THEN4700                          NK
4706 PRINT:GOTO4740                                   DI
4710 FORB=0TO7:AC=PEEK(AD+B):GOSUB3030:IFAD+B
=ENTHENAD=SR:GOSUB1080:GOTO110                        BK
4715 PRINT" ";:NEXTB                                  EC
4720 PRINT:AD=AD+8                                    GN
4730 GETB$:IFB$=CHR$(136)THEN110                      MN
4740 GOSUB3010:PRINT": ";:GOTO4710                    JD
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 113 and 116 explain these codes and provide other essential information on entering ***Ahoy!*** programs. Refer to these pages **before** entering any programs!

TALKING CLOCK

FROM PAGE 38

```
1 PRINT"[CLEAR]"                                          HH
2 PRINT  SPC(7)"[9"[DOWN]"]C64TIME"                       KN
3 PRINT SPC(9)"[4"[DOWN]"]BY"                             OB
4 PRINT SPC(2)"[DOWN]ISAAC MICHALOWSKI"                   LI
5 PRINT SPC(6)"[DOWN][DOWN]12/09/83"                      JC
6 PRINT "[DOWN][DOWN] MOD. FOR THE C64/1
28"                                                       PC
7 PRINT SPC(9)"[DOWN][DOWN]BY"                            LO
8 PRINT SPC(2)"[DOWN]MORTON KEVELSON"                     JF
9 PRINT SPC(6)"[DOWN][DOWN] 5/17/85"                      KO
10 FORX=1TO800:NEXTX                                      BP
14 PRINT"[CLEAR]"                                         HH
15 DIMA$(6)                                               HG
20 PRINT "[4"[DOWN]"][7"[RIGHT]"][GREEN]
[RVSON]TIME SET[RVSOFF]"                                  FJ
25 PRINT"[DOWN][DOWN][4"[RIGHT]"]24 HOUR
 FORMAT"                                                  PN
30 PRINT"[RIGHT][RIGHT][6"[DOWN]"][RIGHT
]ENTER TIME IN THE"                                       CL
35 PRINT"[3"[RIGHT]"]FOLLOWING MANNER"                    LM
40 PRINT"[DOWN][DOWN][6"[RIGHT]"][YELLOW
]HH=HOURS"                                                JE
44 PRINT"[GREEN][6"[RIGHT]"]MM=MIUTES"                    HL
45 PRINT"[6"[RIGHT]"][WHITE]SS=SECONDS"                   IE
50 PRINT"[RIGHT][RIGHT][DOWN][DOWN][YELL
OW]HH[GREEN]MM[WHITE]SS"                                  LF
55 INPUTA$                                                PH
56 IFMID$(A$,7,7)=>"0"THEN3050                            PE
60 IF  A$>"235959"GOTO3000                                JO
65 TI$=A$                                                 NK
70 PRINT SPC(8)"RUNNING"                                  CB
120 SP(1)= 31 :SP(2)= 24                                  JN
130 DRT=37136:DDR=37138:DFL=37149:DCB=37
148: REM FOR VIC-20                                       PD
135 REM: DRT=56577:DDR=56579:DFL=56578:D
CB=56576:REM FOR C-64/128                                 KG
140 POKE DDR,127                                          DA
150 A=PEEK(DCB)AND 15:REM FOR VIC-20                      CB
155 REM: A=PEEK(DFL)OR 4:REM FOR C-64/12
8                                                         LA
160 POKE(DCB),160 OR A:REM FOR VIC-20                     KL
165 REM: POKE(DFL),A:REM FOR C-64/128                     GC
170 REM: GOSUB 3110:REM FOR C-64/128                      AN
200 REM**STRIP TIME**                                     BO
210 A$=LEFT$(TI$,2)                                       DK
220 A=VAL(A$)                                             HB
230 REM**STRIP MINUTES**                                  NM
240 B$=MID$(TI$,3,2)                                      KJ
250 B=VAL(B$)                                             HH
260 Z=0                                                   EH
261 T=0                                                   DB
265 IF A<21 THEN Z=1:GOTO330                              DL
266 T=0                                                   DB
270 IF A=21 THEN A1=1:T=A:GOTO320                         KD
280 IF A=22 THEN A1=2:T=A:GOTO320                         PP
290 IF A=23 THEN A1=3:T=A:GOTO320                         AP
320 A=20                                                  FE
330 REM**CHECK MINUTES**                                  MK
340 IF B=0  GOTO 1000                                     PH
350 IF B<10 THEN B1=B:B=0:GOTO1040                        CM
360 IF B=50 THEN B=23:GOTO1080                            JF
370 IF B>50 THEN B1=B-50:B=23:GOTO1040                    EJ
380 IF B=40 THEN B=22:GOTO1080                            JJ
390 IF B>40 THEN B1=B-40:B=22:GOTO1040                    FG
400 IF B=30 THEN B=21:GOTO1080                            HB
410 IF B>30 THEN B1=B-30:B=21:GOTO1040                    DD
420 IF B>20 THEN B1=B-20:B=20:GOTO1040                    EA
430 GOTO 1080                                             FK
1000 REM**TOP OF HOUR**                                   BD
1010 IF T<21ANDA<21THEN SP(3)=A:SP(4)=29
:SP(5)=33:N=3:GOTO2000                                    NM
1020 SP(3)=A:SP(4)=A1:SP(5)=29:SP(6)=33:
N=4:GOTO2000                                              EI
1030 GOTO 2000                                            EP
1040 REM**SOUND FORMAT MINUTES**                          IJ
1050 IF Z=1 THEN SP(3)=A:SP(4)=27:SP(5)=
B:SP(6)=B1:SP(7)=28:N=5:GOTO2000                          CL
1060 SP(3)=A:SP(4)=A1:SP(5)=27:SP(6)=B
:SP(7)=B1:SP(8)=28:N=6                                    BF
1070 GOTO 2000                                            EP
1080 REM**SOUND FORMAT MINUTES10,20,30,4
0,50 ONLY**                                               GF
1090 IF Z=1 THEN SP(3)=A:SP(4)=27:SP(5)=
B:SP(6)=28:N=4:GOTO 2000                                  MH
1100 SP(3)=A:SP(4)=A1:SP(5)=27:SP(6)=B:S
P(7)=28:N=5:GOTO 2000                                     KC
2000 REM**SPEAK!!**                                       PC
2010 FOR X=1 TO N+2                                       IH
2020 IF PEEK(DRT)>127 GOTO 2020                           BN
2030 POKE DRT,SP(X)                                       BF
2035 GOSUB3100                                            FF
2040 NEXT X                                               NK
2050 REM**TOP OF MINUTE**                                 KG
2060 C$=RIGHT$(TI$,2)                                     DN
2070 C=VAL(C$)                                            HN
2080 IF C=00 GOTO 200                                     AL
2090 GOTO 2060                                            FB
3000 REM**ERROR MESSAGE**                                 PG
3010 PRINT"[CLEAR]TIME SET IS GREATER[3"
"]THAN 235959"                                            JA
3030 FORE=1TO3500:NEXTE                                   CN
3040 PRINT"[CLEAR]":GOTO30                                KB
3050 PRINT"[CLEAR]ENTER ONLY 6 DIGITS":G
OTO3020                                                   NH
3100 REM POKE DCB,PEEK(DCB)AND251:REM FO
R C-64/128                                                AB
3110 REM POKE DCB,PEEK(DCB)OR4:REM FOR C
-64/128                                                   JJ
3120 REM RETURN:REM FOR C-64/128                          HG
```

AHOY! BABBLER
FROM PAGE 38

FROM PAGE 38

VIC 20 DEMO

```
•10 REM **** AHOY! SPEAKS ****                        PN
•20 REM ****VIC-20 VERSION****                        DG
•30 REM BY **MORTON KEVELSON**                        KJ
•130 DRT=37136:DDR=37138:DFL=37149:DCB=37
 148:REM VIC-20 USER PORT                             LM
•140 POKE DDR,127:REM SET DDR FOR OUTPUT              ID
•150 A=PEEK(DCB)AND15                                 OF
•160 POKE(DCB),160 OR A:REM SET BIT 2 FOR
  INPUT                                               OH
•165 GOSUB 3110                                       FP
•2000 REM**SPEAK!!**                                  PC
•2010 FOR I=1 TO 17                                   MC
•2015 READ X                                          OF
•2020 IF PEEK(DRT)>127 GOTO 2020                      NM
•2030 POKE DRT,X                                      BH
•2035 GOSUB3100                                       FF
•2040 NEXT I:END                                      IM
•3100 POKE DCB,PEEK(DCB)AND251:REM SET CO
 NTROL LINE LOW, UTTER ALLOPHONE                      NE
•3110 POKE DCB,PEEK(DCB)OR4:REM SET CONTR
 OL LINE HIGH, READY FOR NEXT                         JM
•3120 RETURN                                          IM
•3999 REM ALLOPHONE DATA                              GM
•4000 DATA 23,27,5,3                                  FD
•4010 DATA 8,24,16,24,33,58,3                         AK
•4020 DATA 25,31,43,52,55,3                           MK
```

C-64/128 DEMO

```
•10 REM **** AHOY! SPEAKS ****                        DP
•20 REM ***C-64/128 VERSION***                        MJ
•30 REM **BY MORTON KEVELSON**                        MM
•130 DRT=56577:DDR=56579:DFL=56578:DCB=56
 576:REM C-64 USER PORT                               FA
•140 POKE DDR,127:REM SET DRT FOR OUTPUT              JA
•150 A=PEEK(DFL)OR 4                                  ME
•160 POKE(DFL),A:REM SET BIT 2 FOR INPUT              PA
•165 GOSUB 3110                                       FE
•2000 REM**SPEAK!!**                                  PC
•2010 FOR I=1 TO 17                                   MK
•2015 READ X                                          OD
•2020 IF PEEK(DRT)>127 GOTO 2020                      BN
•2030 POKE DRT,X                                      BB
•2035 GOSUB3100                                       FF
•2040 NEXT I:END                                      IK
•3100 POKE DCB,PEEK(DCB)AND251:REM SET CO
 NTROL LINE LOW, UTTER ALLOPHONE                      DF
•3110 POKE DCB,PEEK(DCB)OR4:REM SET CONTR
 OL LINE HIGH, READY FOR NEXT                         HH
•3120 RETURN                                          IM
•3999 REM ALLOPHONE DATA                              EN
•4000 DATA 23,27,5,3                                  EH
•4010 DATA 8,24,16,24,33,58,3                         PN
•4020 DATA 25,31,43,52,55,3                           LP
```

THE MAGICAL LINK
FROM PAGE 20

FROM PAGE 20

RS-232 RECEIVER

```
•30000 REM -=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-      KC
•30001 REM    - RS-232 RECEIVER -               KF
•30002 REM     RUPERT REPORT #25                OM
•30003 REM =-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=      NC
•30004 REM RECEIVE AN ASCII PROGRAM FROM        FM
•30005 REM THE RS-232 PORT INTO MEMORY          LM
•30006 REM =-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=      NC
•30030 PRINT CHR$(147);                         JL
•30040 OPEN 2,2,0,CHR$(8)+CHR$(0)               NG
•30050 REM - GET UP TO 80 CHARACTERS -          IN
•30060 GOSUB 30120                              JB
•30070 PRINT L$                                 AI
•30080 PRINT "RUN 3[4"0"]"                      PB
•30090 POKE 631,19 : POKE 632,13 : POKE 6
 33,13 : POKE 198,3 :REM FILL KBD BUFFER        JH
•30100 CLOSE 2 : END                            JB
•30110 REM == GET UP TO 80 CHARACTERS ==        MG
•30120 GET#2,C$ : IF C$="" THEN 30120           GN
•30130 IF C$=CHR$(13) THEN 30160                OM
•30140 IF C$=CHR$(26) THEN PRINT#2 : CLOS
 E 2 : GOTO 30180                               GG
•30150 L$=L$+C$ : GOTO 30120                    HN
•30160 L$=LEFT$(L$,79)                          EG
•30170 RETURN                                   IM
•30180 REM  DELETE LINES OF THIS PROGRAM        EK
•30190 FOR N=30000 TO 30200 STEP 10 :PRIN
 T N : NEXT                                     PC
•30200 PRINT"PRESS <HOME> AND 21 <RETURNS
 > TO DELETE THESE LINES";                      KA
```

ASCII TRANSMITTER

```
•1 REM =-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-     DD
•2 REM      - ASCII TRANSMITTER -             OA
•3 REM        RUPERT REPORT #25               OM
•4 REM =-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-     DD
•5 REM TRANSMIT ASCII FORM OF PROGRAM         IC
•6 REM OVER THE RS-232 CHANNEL                PA
•7 REM =-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=-     DD
•8 OPEN 2,2,0,CHR$(8) : CMD 2 : LIST          LO
•9 PRINT#2,CHR$(26):PRINT#2:CLOSE 2:END       FJ
•10 REM  -ADD THIS PROGRAM TO THE PROGRAM
 TO BE TRANSMITTED AND TYPE 'RUN 8'           ID
•11 REM  -WHEN THE LISTING IS DONE,           PG
•12 REM  -TYPE 'RUN 9' TO CLOSE THE FILE      DE
```

SEQUENTIAL TRANSMITTER

```
•10 REM =-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=       NC
•20 REM  - SEQUENTIAL TRANSMITTER -           NM
•30 REM      RUPERT REPORT #25                OM
•40 REM =-=-=-=-=-=-=-=-=-=-=-=-=-=-=-=       NC
•50 REM  TRANSMIT A SEQUENTIAL FILE           GC
•60 REM  TO THE RS-232 PORT                   LI
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 113 and 116 explain these codes and provide other essential information on entering ***Ahoy!*** programs. Refer to these pages **before** entering any programs!

```
·70 REM =-=-=-=-=-=-=-=-=-=-=-=-=-=-=       NC
·80 PRINT CHR$(147)                          FG
·90 OPEN 2,2,0,CHR$(8)+CHR$(0)               NG
·100 PRINT"ENTER THE -FILENAME- OF THE       IP
·110 PRINT"SEQUENTIAL FILE TO BE SENT"       HK
·120 INPUT F$                                BF
·130 OPEN 8,8,8,F$+",SEQ,R"                  BO
·140 GET#8, C$ : IF C$="" THEN 140           HG
·150 SS=ST                                   AJ
·160 PRINT#2,C$;                             KC
·170 IF ASC(C$)<32 OR ASC(C$)>127 THEN C$
 ="*"                                        BK
·180 PRINT C$;                               GA
·190 IF SS=0 THEN 140 :REM NOT EOF           MK
·200 PRINT#2,CHR$(26) : PRINT#2 : CLOSE 2
 : CLOSE 8                                   NG
```

SEQUENTIAL RECEIVER

```
·10 REM =-=-=-=-=-=-=-=-=-=-=-=-=-=-=        NC
·20 REM  - SEQUENTIAL RECEIVER -             BL
·30 REM      RUPERT REPORT #25               OM
·40 REM =-=-=-=-=-=-=-=-=-=-=-=-=-=-=        NC
·50 REM  RECEIVE A SEQUENTIAL FILE           MH
·60 REM  FROM THE RS-232 PORT                DK
·70 REM =-=-=-=-=-=-=-=-=-=-=-=-=-=-=        NC
·80 PRINT CHR$(147)                          FG
·90 OPEN 2,2,0,CHR$(8)+CHR$(0)               NG
·100 GET#2,J$ :IF (ST AND 8)=0 THEN  100
 : REM CLEAR THE RECEIVE BUFFER              HP
·110 PRINT"SEND FILE TO  (1) PRINTER, (2)
 DISK, OR (3) SCREEN" : INPUT A$             LD
·120 N=VAL(A$)                               JO
·130 ON N GOTO 150,160,180                   JE
·140 GOTO 110 : REM  TRY AGAIN               HN
·150 OPEN 1,4,4 : GOTO 190 :REM PRINTER      NB
·160 INPUT"SAVE WITH WHAT FILENAME";F$       LF
·170 OPEN 1,8,8,F$+",S,W" : GOTO 190         MP
·180 OPEN 1,3    :REM SCREEN                 LH
·190 REM - RECEIVE DATA -                    DA
·200 GET#2,C$ : IF C$="" THEN 200            OK
·210 PRINT#1, C$;                            KD
·220 IF C$<>CHR$(26) THEN 200                PD
·230 PRINT#1 : CLOSE 1                       NE
·240 CLOSE 2 : END                           JB
```

THE MARTIAN MONSTERS FROM PAGE 72

```
·2 REM THE MARTIAN MONSTERS                  OG
·3 REM BY J.C.HILTY                          LE
·5 POKE 52,48:POKE 56,48                     IC
·10 S=54272:FORL=STOS+24:POKEL,0:NEXT        JM
·40 V=53248                                  AD
·200 PRINT"[CLEAR]":POKE 53280,0:POKE 532
 81,0                                        OD
·220 PRINT"[HOME][CYAN][3"[DOWN]"]T H E[3
 " "]M A R T I A N[3" "]M O N S T E R S"     OG
·230 PRINT                                   JJ
·240 PRINT TAB(14)"[RED][RVSON] [RVSOFF][
 6" "][RVSON] "                              OK
·250 PRINT TAB(15)"[RVSON] [RVSOFF][4" "]
 [RVSON] "                                   KO
·260 PRINT TAB(9)"[BLUE][RVSON] [RVSOFF]
 [RVSON] [RVSOFF][4" "][RED][RVSON] [RVSO
 FF]  [RVSON] "                              JA
·270 PRINT TAB(9)"[BLUE][RVSON][3" "][RVS
 OFF][3" "][GREEN][RVSON][6" "][RVSOFF][5
 " "][BLUE][RVSON]  "                        LN
·280 PRINT TAB(10)"[BLUE][RVSON] [RVSOFF]
 [3" "][GREEN][RVSON][8" "][RVSOFF][4" "]
 [BLUE][RVSON] "                             NO
·290 PRINT TAB(10)"[BLUE][RVSON][3" "][GR
 EEN][4" "][RVSOFF] [RVSON] [RVSOFF] [RVS
 ON][3" "][BLUE][4" "]"                      NG
·300 PRINT TAB(13)"[GREEN][RVSON][10" "][
 RVSOFF][3" "][BLUE][RVSON]  "               KM
·310 PRINT TAB(14)"[GREEN][RVSON][8" "]"     FA
·320 PRINT TAB(15)"[GREEN][RVSON][6" "]"     BK
·330 PRINT TAB(16)"[BLUE][RVSON] [RVSOFF]
 [3" "][RVSON] "                             IO
·340 PRINT TAB(16)"[RVSON] [RVSOFF][3" "]
 [RVSON] "                                   GO
·350 PRINT TAB(15)"[RVSON][3" "][RVSOFF]
 [RVSON][3" "]"                              KK
·360 PRINT                                   JJ
·370 PRINT TAB(2)"[CYAN][3"."]SPACESHIPS
 ARE OUR FAVORITE FOOD[3"."]"                CJ
·380 PRINT                                   JJ
·390 PRINT TAB(4)"[3"."]AND WE ARE GETTIN
 G HUNGRY[3"."]"                             PL
·405 POKE S+24,15:POKE S+1,15:POKE S+5,16
 :POKE S+6,240:POKE S+4,21                   HG
·420 FOR T=1 TO 3                            KB
·425 R=10                                    GK
·430 POKE S+15,R                             HB
·450 R=R+1:IF R=200 THEN 470                 MH
·460 GOTO 430                                CH
·470 NEXT T                                  NG
·480 FOR I=0 TO 24:POKE S+I,0:NEXT           DI
·520 PRINT"[CLEAR]":PRINT"[4"[DOWN]"]"TAB
 (4)"PLEASE WAIT FOR ONE MOMENT[3"."]"       HL
·521 PRINT:PRINT"..WHILE WE WORK UP AN AP
 PETITE FOR YOU.."                           JJ
·525 FOR X=50880 TO 51116:READ A:POKE X,A
 :NEXT                                       ND
·530 FOR X=49152 TO 49528:READ A:POKE X,A
 :NEXT                                       LP
·535 FOR X=12288 TO 12671:READ A:POKE X,A
 :NEXT                                       JI
·540 POKE 49522,1:POKE 49523,0:POKE 49524
 ,30:POKE 49525,0:POKE 49526,23              JA
```

```
·554 PRINT"[CLEAR]"                            HH
·555 FOR P=0 TO 18                             MB
·560 T$="":FOR I=0 TO 30:T=32                  CO
·570 IF INT(RND(2)*7)<1 THEN T=46:IF INT(
 RND(2)*5)<1 THEN T=42                         DD
·580 T$=T$+CHR$(T):NEXT I                      LN
·590 T$=T$+CHR$(170)                           AN
·600 PRINT T$                                  BA
·610 NEXT P                                    NC
·620 PRINT"[RED][RVSON]  [c *][RVSOFF][9"
 "][RVSON][sEP] [c *][RVSOFF] [RVSON][sE
 P] [c *][RVSOFF][11" "][RVSON][sEP]"          NN
·630 PRINT"[RVSON][4" "][c *][RVSOFF]  [R
 VSON][sEP] [c *][sEP][11" "][c *][RVSOFF
 ] [RVSON][sEP] [c *][RVSOFF] [RVSON][sEP
 ] "                                           GG
·640 PRINT"[RVSON][31" "]"                     HG
·650 PRINT"[RVSON][31" "]"                     HG
·652 PRINT"[HOME]":PRINT TAB(34)"[GREEN]T
 HE"                                           AG
·653 PRINT TAB(32)"MARTIAN"                    BC
·654 PRINT TAB(32)"MONSTERS"                   IK
·655 PRINT"[4"[DOWN]"]":PRINTTAB(33)"SCOR
 E"                                            KH
·656 PRINT:PRINT:PRINT TAB(33)"SHIPS"          FH
·660 PRINT:PRINT:PRINT TAB(33)"MISSED":PR
 INT TAB(33)"SHOTS"                            BE
·662 SC=0:SH=5:MS=0                            NO
·665 PRINT"[HOME]":PRINT"[13"[DOWN]"]"TAB
 (34)SH                                        OL
·666 PRINT"[HOME]":PRINT"[10"[DOWN]"]"TAB
 (34)SC                                        EK
·667 PRINT"[HOME]":PRINT"[17"[DOWN]"]"TAB
 (34)MS                                        CG
·669 REM PREPARE SPRITES                       KJ
·672 POKE 2040,193:POKE 2041,194               KP
·674 FOR T=2042 TO 2046                        NK
·675 POKE T,192                                LL
·676 NEXT T                                    NG
·680 POKE V+39,1:POKE V+40,10:POKE V+41,5
 :POKE V+42,4                                  DD
·685 POKE V+28,1:POKE V+37,6:POKE V+38,2       AC
·690 POKE V+43,7:POKE V+44,8:POKE V+45,6       LL
·700 X0=140:Y0=160                             OJ
·710 POKE V+0,X0:POKE V+1,Y0                   CL
·720 POKE V+4,35:POKE V+5,60                   BG
·730 POKE V+6,85:POKE V+7,60                   OB
·740 POKE V+8,135:POKE V+9,60                  DP
·750 POKE V+10,185:POKE V+11,60                JL
·760 POKE V+12,235:POKE V+13,60                HF
·765 POKE V+21,125                             LO
·770 POKE 50437,0:POKE 50438,255               FM
·780 POKE 50439,0:POKE 50440,2                 CC
·790 POKE 50441,0:POKE 50442,254               LB
·800 POKE 50443,0:POKE 50444,1                 DI
·810 POKE 50445,0:POKE 50446,253               LC
·815 POKE 50435,0:POKE 50436,255               LE
·820 POKE 50432,124                            GO
·830 SYS 51104                                 KF
·840 REM MAIN LOOP                             PK
·850 POKE V+0,X0:POKE V+1,Y0                   CL
·860 X0=X0+5:IF X0>250 THEN X0=30              HI
·870 JY=PEEK(56321)AND15                       HM
·880 IF JY=13THENY0=Y0+4:IF Y0>205 THEN Y
 0=205                                         JA
·890 IF JY=14 THEN Y0=Y0-4:IF Y0<70 THEN
 Y0=70                                         NN
·900 FB=-((PEEK(56321)AND16)=0):IF FB=1 T
 HEN 2000                                      PB
·910 W=PEEK(V+30)                              HN
·920 IF W=5 THEN Q=2042:GOTO 3000              OD
·930 IF W=9 THEN Q=2043:GOTO 3000              AA
·940 IF W=17 THEN Q=2044:GOTO 3000             PA
·950 IF W=33 THEN Q=2045:GOTO 3000             ED
·960 IF W=65 THEN Q=2046:GOTO 3000             PF
·965 SYS 49152                                 KF
·970 GOTO 850                                  DB
·2000 REM FIRE LASER                           DI
·2005 POKE 50432,0                             AG
·2010 POKE V+2,X0:POKE V+3,Y0-12               GG
·2015 POKE V+21,127                            LM
·2020 POKE 50432,2                             AI
·2030 IF PEEK(V+3)<55 THEN 2500                EL
·2035 W1=PEEK(V+30)                            ME
·2040 IF W1=6 THEN Q=2042:GOTO 2600            NK
·2050 IF W1=10 THEN Q=2043:GOTO 2600           ED
·2060 IF W1=18 THEN Q=2044:GOTO 2600           IM
·2070 IF W1=34 THEN Q=2045:GOTO 2600           DD
·2080 IF W1=66 THEN Q=2046:GOTO 2600           KB
·2090 GOTO 2030                                FE
·2499 REM MISSED SHOT                          JJ
·2500 MS=MS+1                                  MA
·2505 PRINT"[HOME]":PRINT"[17"[DOWN]"]"TA
 B(34)MS                                       CG
·2510 POKE V+21,125                            LO
·2530 POKE V+23,124:POKE V+29,124              JL
·2531 P=195                                    KH
·2532 FOR T=1 TO 8                             KE
·2533 FOR Z=2042 TO 2046                       NA
·2534 POKE Z,P                                 HA
·2535 NEXT Z                                   NM
·2536 P=P+1:IF P=197 THEN P=195                OB
·2537 POKE S+5,9:POKE S+6,0:POKE S+24,15       II
·2538 POKE S+1,80:POKE S,15:POKE S+4,33        OF
·2539 FOR E=0 TO 50:NEXT E                     LE
·2540 POKE S+4,32                              FM
·2541 NEXT T                                   NG
·2542 W1=PEEK(V+30)                            ME
·2543 FOR Z=2042 TO 2046:POKE Z,192:NEXT       JC
·2544 POKE V+23,0:POKE V+29,0                  CH
·2545 POKE 50432,124                           GO
·2548 IF MS=5 THEN 7000                        JA
·2550 GOTO 850                                 DB
·2599 REM LASER HITS MARTIAN                   GI
·2600 SC=SC+100                                CN
·2602 PRINT"[HOME]":PRINT"[10"[DOWN]"]"TA
```

```
B(33)SC                                          EL
•2605 POKE V+21,125                              LO
•2606 POKE Q,197                                 LB
•2608 GOSUB 3500                                 FB
•2630 FOR I=0 TO 24:POKE S+I,0:NEXT              DI
•2631 POKE S+24,15:POKE S+1,15:POKE S+5,1
6                                                KG
•2632 POKE S+6,240:POKE S+4,21                   DK
•2633 R=80                                       HF
•2634 POKE S+15,R                                HB
•2635 R=R+1:IF R=160 THEN 2640                   PK
•2636 GOTO 2634                                  FG
•2640 FOR I=0 TO 24:POKE S+I,0:NEXT              DI
•2642 POKE Q,192                                 KK
•2650 W1=PEEK(V+30)                              ME
•2655 POKE 50432,124                             GO
•2660 GOTO 850                                   DB
•3000 REM MARTIAN EATS SPACESHIP                 EA
•3005 POKE 50432,0                               AG
•3010 IF Q=2042 THEN POKE V+29,4:POKE V+2
3,4                                              OG
•3020 IF Q=2043 THEN POKE V+29,8:POKE V+2
3,8                                              EF
•3030 IF Q=2044 THEN POKE V+29,16:POKE V+
23,16                                            AB
•3040 IF Q=2045 THEN POKE V+29,32:POKE V+
23,32                                            CC
•3050 IF Q=2046 THEN POKE V+29,64:POKE V+
23,64                                            HP
•3060 POKE 2040,197                              DK
•3070 GOSUB 3500                                 FB
•3080 POKE V+21,124                              LP
•3090 P=195                                      KH
•3100 FOR I=0 TO 24:POKE S+I,0:NEXT              DI
•3110 POKE S+5,9:POKE S+6,0:POKE S+24,15         II
•3120 FOR T=1 TO 8                               KE
•3130 POKE Q,P                                   GH
•3140 P=P+1:IF P=197 THEN P=195                  OB
•3150 POKE S+1,80:POKE S,15:POKE S+4,33          OF
•3160 FOR E=0 TO 50:NEXT E                       LE
•3170 POKE S+4,32                                FM
•3180 NEXT T                                     NG
•3190 SH=SH-1                                    ML
•3195 PRINT"[HOME]":PRINT"[13"[DOWN]"]"TA
B(34)SH                                          OL
•3200 POKE 2040,193                              DG
•3210 POKE Q,192                                 KK
•3212 POKE V+29,0:POKE V+23,0                    CH
•3215 X0=160:Y0=140                              OB
•3220 POKE V+0,X0:POKE V+1,Y0                    CL
•3230 POKE V+21,125                              LO
•3240 POKE V+8,135:POKE V+9,60                   DP
•3260 POKE 50432,124                             GO
•3265 W=PEEK(V+30)                               HN
•3268 IF SH=0 THEN 7000                          IE
•3270 GOTO 965                                   DC
•3499 REM EXPLOSION SOUND                        OM
•3500 FOR I=0 TO 24:POKE S+I,0:NEXT              DI
•3510 POKE S+24,15:POKE S+12,160:POKE S+1
3,252                                            FC
•3520 POKE S+8,80:POKE S+7,40:POKE S+11,1
29                                               GN
•3530 FOR T=0 TO 100:NEXT                        LC
•3540 POKE S+11,128                              OB
•3550 RETURN                                     IM
•4000 REM ML SPRITE ROUTINE                      BE
•4010 DATA 169,255,45,0,198,240,16,169,0,
141,0,198,162,21,189,0                           MN
•4020 DATA 197,157,0,198,202,208,247,162,
1,169,1,141,80,197,173,80                        KK
•4030 DATA 197,45,0,197,240,3,76,243,198,
232,232,14,80,197,208,238                        OJ
•4040 DATA 76,49,234,169,0,29,0,197,208,3
,76,97,199,169,128,61                            CC
•4050 DATA 0,197,240,48,254,0,198,208,40,
222,255,207,76,144,199,80                        LE
•4060 DATA 197,45,16,208,208,12,173,16,20
8,13,80,197,141,16,208,76                        NB
•4070 DATA 43,199,173,16,208,77,80,197,14
1,16,208,189,0,197,157,0                         OO
•4080 DATA 198,76,97,199,222,0,198,208,40
,254,255,207,208,29,173,80                       AB
•4090 DATA 197,45,16,208,208,12,173,16,20
8,13,80,197,141,16,208,76                        NB
•4100 DATA 91,199,173,16,208,77,80,197,14
1,16,208,189,0,197,157,0                         CD
•4110 DATA 198,169,0,232,29,0,197,208,3,7
6,140,199,169,128,61,0                           PO
•4120 DATA 197,240,11,254,0,198,208,20,22
2,255,207,76,134,199,222,0                       KC
•4130 DATA 198,208,9,254,255,207,189,0,19
7,157,0,198,202,76,233,198                       FP
•4140 DATA 169,255,221,255,207,240,3,76,4
3,199,173,80,197,76,17,199                       BD
•4150 DATA 120,169,192,141,20,3,169,198,1
41,21,3,88,96                                    JL
•5000 REM SCROLL DATA                            GJ
•5010 DATA 174,114,193,224,3,144,3,76,117
,192,188,114,193,140,121,193,174                 GI
•5020 DATA 118,193,232,202,32,30,193,172,
121,193,173,119,193,201,2,208,10                 EL
•5030 DATA 169,32,72,173,33,208,72,76,50,
192,177,90,72,177,92,72,204                      CN
•5040 DATA 116,193,240,20,200,177,90,72,1
77,92,136,145,92,104,145,90,200                  CI
•5050 DATA 204,116,193,208,238,240,18,136
,177,90,72,177,92,200,145,92,104                 AK
•5060 DATA 145,90,136,204,115,193,208,238
,173,119,193,201,0,208,5,104,104                 KD
•5070 DATA 76,111,192,104,145,92,104,145,
90,236,117,193,208,160,96,172,116                OJ
•5080 DATA 193,200,189,114,193,170,32,30,
193,173,120,193,201,2,208,19,136                 OP
•5090 DATA 169,32,153,122,193,173,33,208,
153,162,193,204,115,193,208,239,240              KB
•5100 DATA16,136,177,90,153,122,193,177,9
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 113 and 116 explain these codes and provide other essential information on entering *Ahoy!* programs. Refer to these pages **before** entering any programs!

```
 2,153,162,193,204,115,193,208,240           CE
•5110 DATA 236,117,193,240,37,202,32,30,1
 93,172,116,193,200,136,177,90,72            MG
•5120 DATA 177,92,32,48,193,145,92,104,14
 5,90,32,56,193,204,115,193,208              HJ
•5130 DATA 234,236,117,193,208,221,240,46
 ,202,206,118,193,232,32,30,193,172          GF
•5140 DATA 116,193,200,136,32,48,193,177,
 90,72,177,92,32,56,193,145,92               IC
•5150 DATA 104,145,90,204,115,193,208,234
 ,236,118,193,208,221,238,118,193,232        AL
•5160 DATA 32,30,193,173,120,193,201,0,24
 0,20,172,115,193,136,200,185,162            DK
•5170 DATA 193,145,92,185,122,193,145,90,
 204,116,193,208,240,96,189,89,193           EP
•5180 DATA 133,91,24,105,212,133,93,189,6
 4,193,133,90,133,92,96,72,152               IA
•5190 DATA 24,105,40,168,104,96,72,152,56
 ,233,40,168,104,96,0,40,80                  LL
•5200 DATA 120,160,200,240,24,64,104,144,
 184,224,8,48,88,128,168,208,248             LK
•5210 DATA 32,72,112,152,192,4,4,4,4,4,4,
 4,5,5,5,5,5                                 JG
•5220 DATA 5,6,6,6,6,6,6,6,7,7,7,7,7,3,0,
 4,0                                         LE
•5230 DATA 4,1,1                             HP
•5232 REM MONSTER DATA                       OM
•5235 DATA 6,0,96,3,0,192,1,129,128,0,195
 ,0,0,126,0,0,255,0                          OD
•5240 DATA 1,255,128,3,255,192,227,255,19
 9,63,221                                    HF
•5244 DATA 252,227,255,199,3,255,192,1,25
 5,128                                       HI
•5248 DATA 0,255,0,0,66,0,0,66,0,0,231,0,
 0,0,0,0,0,0,0,0,0,0,0,0,0                   GI
•5250 REM ROCKET MULTICOLOR DATA             KD
•5260 DATA 0,32,0,0,32,0,0,32,0,0,168,0,0
 ,168,0,1,169,0,5,169,64                     HI
•5270 DATA 21,169,80,85,169,84,0,168,0,0,
 168,0,0,168,0,0,168,0,3,255,0               FB
•5280 DATA 15,255,192,63,255,240,15,255,1
 92,0,48,0,0,0,0,0,0,0,0,0,0,0               AP
•5290 REM LASER DATA                         CE
•5300 DATA 0,56,0,0,56,0,0,56,0,0,56,0,0,
 56,0,0,56,0,0,56,0,0,56,0                   PG
•5310 DATA 0,56,0,0,56,0,0,56,0,0,56,0,0,
 56,0                                        MJ
•5320 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,
 0,0,0,0,0,0,0,0,0,0                         NH
•5330 REM GOBBLE DATA                        GP
•5340 DATA 3,0,0,1,128,0,0,192,0,0,60,0,0
 ,126,0,0,255,0,1,247,224                    OC
•5350 DATA 1,255,224,1,252,0,1,248,0,0,24
 8,0,0,120,0,0,60,0                          IC
•5360 DATA 0,39,192,0,35,192,0,32,0,0,112
 ,0,0,0,0,0,0,0,0,0,0,0,0,0,0                EP
•5370 REM MORE GOBBLE DATA                   JC
•5380 DATA 3,0,0,1,128,0,0,192,0,0,60,0,0
 ,126,0,0,255,0,1,247,128                    PJ
•5390 DATA 1,255,192,1,255,192,1,255,192,
 0,255,192,0,127,128,0,62,0                  FF
•5400 DATA 0,32,0,0,32,0,0,32,0,0,112,0,0
 ,0,0,0,0,0,0,0,0,0,0,0,0                    AL
•5410 REM EXPLOSION                          FG
•5420 DATA 0,0,0,76,1,0,0,128,4,32,4,32,0
 ,48,0,8,0,0,0,32,48,80,0,130                JG
•5430 DATA 3,12,0,0,0,4,32,0,128,0,36,0,0
 ,0,192,201,0,4,0,0,0,19,32,192              DO
•5440 DATA 0,4,0,32,0,1,4,192,0,0,4,8,0,0
 ,0,0                                        NC
•6999 REM GAME OVER-PLAY AGAIN OPTION        DB
•7000 PRINT"[CLEAR]"                         HH
•7010 POKE V+21,124                          LP
•7020 PRINT"[8"[DOWN]"]"TAB(6)"YUMMY[3"."
 ]"                                          PJ
•7030 PRINT TAB(14)"YUMMY[3"."]"             FO
•7040 PRINT TAB(22)"YUMMY[3"."]"             DL
•7050 PRINT:PRINT TAB(4)"WE GOT SPACESHIP
 S IN OUR TUMMY[4"!"]"                       EL
•7060 FOR I=0 TO 24:POKE S+I,0:NEXT          DI
•7070 POKE S+24,15:POKE S+1,15:POKE S+5,1
 6                                           KG
•7080 POKE S+6,240:POKE S+4,21               DK
•7090 FOR T=1 TO 2                           JO
•7100 R=10                                   GK
•7110 POKE S+15,R                            HB
•7120 R=R+1                                  DB
•7130 IF R=200 THEN 7150                     KI
•7140 GOTO 7110                              FE
•7150 NEXT T                                 NG
•7160 FOR I=0 TO 24:POKE S+I,0:NEXT          DI
•7170 PRINT"[CLEAR]"                         HH
•7190 PRINT "[10"[DOWN]"]"TAB(9)"S C O R
 E[5" "]"SC                                  MN
•7200 PRINT:PRINT                            GJ
•7210 PRINT TAB(6)"PLAY AGAIN?[6" "]Y OR
 N"                                          DN
•7215 GET JUNK$:IF JUNK$<>"" THEN 7215       EC
•7220 GET A$:IF A$="" THEN 7220              NN
•7230 IF A$="Y" THEN 7250                    NH
•7240 END                                    IC
•7250 POKE V+21,0:POKE 50432,0               HO
•7260 PRINT"[CLEAR]"                         HH
•7265 W=PEEK(V+30)                           HN
•7270 RUN                                    II
```

SCRATCH PAD FROM PAGE 91

MAIN PROGRAM

```
•10 FORAD=49152TO49418:READD:POKEAD,D:NEX
```

To enter STREAMER FONT... you must use our *Flankspeed* machine language entry program. Read the introduction to *Flankspeed* on page 116 of this magazine.

```
TAD                                     MA
•20 DATA160,0,177,251,145,253           BP
•30 DATA169,14,145,30,200,240           KH
•40 DATA13,192,232,208,241,166          NF
•50 DATA254,236,127,192,208,234         EL
•60 DATA76,49,234,230,252,230           MF
•70 DATA254,230,31,76,2,192             FD
•80 DATA120,169,49,141,20,3             PP
•90 DATA169,192,141,21,3,88             CM
•100 DATA96,32,159,255,166,198          GL
•110 DATA208,3,76,49,234,202            GC
•120 DATA189,119,2,201,133,208          KI
•130 DATA28,169,0,133,251,133           EB
•140 DATA30,133,253,169,194,133         AN
•150 DATA252,169,216,133,31,169         BP
•160 DATA4,133,254,169,7,141            HB
•170 DATA127,192,76,0,192,201           MP
•180 DATA137,208,29,169,0,133           DO
•190 DATA251,133,253,133,30,169         BF
•200 DATA4,133,252,169,194,133          NK
•210 DATA254,169,197,141,127,192        JG
•220 DATA169,216,133,31,76,0            IN
•230 DATA192,7,201,134,208,30           PI
•240 DATA169,0,133,30,133,253           IC
•250 DATA169,4,133,254,169,232          MG
•260 DATA133,251,169,197,133,252        DI
•270 DATA169,7,141,127,192,169          LA
•280 DATA216,133,31,76,0,192            AL
•290 DATA201,138,208,30,169,0           LD
•300 DATA133,251,133,30,169,4           HI
•310 DATA133,252,169,232,133,253        MK
•320 DATA169,197,133,254,169,216        IK
•330 DATA133,31,169,200,141,127         AJ
•340 DATA192,76,0,192,201,135           KE
•350 DATA208,30,169,208,133,251         MA
•360 DATA169,201,133,252,169,0          KA
•370 DATA133,253,133,30,169,216         MK
•380 DATA133,31,169,4,133,254           LK
•390 DATA169,7,141,127,192,76           IL
•400 DATA0,192,201,139,208,30           KO
•410 DATA169,0,133,251,133,30           DO
•420 DATA169,4,133,252,169,216          LG
•430 DATA133,31,169,208,133,253         AK
•440 DATA169,201,133,254,169,204        KB
•450 DATA141,127,192,76,0,192           GG
•460 DATA76,49,234                      FG
```

LOAD/SAVE

```
•10 PRINT"[CLEAR][4"[DOWN]"]"           LH
•20 INPUT"LOAD OR SAVE (L/S)";A$        IC
•30 IFA$="L"GOTO100                     FF
•40 IFA$="S"GOTO200                     GH
•50 GOTO10                              PH
•100 INPUT"TAPE OR DISC (T/D)";B$:IFB$<>"
T"ANDB$<>"D"THEN100                     LD
•110 INPUT"FILENAME";C$:IFB$="D"THENB=8:C
$="0:"+C$:GOTO140                       DG
•120 B=1                                CO
•140 GOSUB300:POKE780,0:SYS65493:SYS49188 PL
•150 PRINT"[DOWN]RUN/STOP-RESTORE DE-ACTI
VATES"                                  MH
•160 PRINT"TO ACTIVATE: SYS49188":END   OC
•200 PRINT"[3"[RIGHT]"]SAVE F-1 SCREEN[9"
"][3"="]> 1                             KN
•210 PRINT"[3"[RIGHT]"]SAVE F-1 AND F-2 S
CREEN [3"="]> 2                         DF
•220 PRINT"[3"[RIGHT]"]SAVE ALL THREE SCR
EENS  [3"="]> 3                         IB
•230 INPUT"CHOOSE BY NUMBER";A%:IFA%<1ORA
%>3THEN230                              NJ
•250 A=49664+1000*A%                    JM
•260 INPUT"TAPE OR DISC (T/D)";B$:IFB$<>"
T"ANDB$<>"D"THEN260                     LN
•265 IFB$="T"THENB=1:GOTO280            FH
•270 B=8                                DH
•280 INPUT"FILENAME";C$:IFB=8THENC$="0:"+
C$:OPEN15,8,15,"S"+C$:CLOSE15           AH
•295 GOSUB300                           CD
•297 POKE780,251:POKE251,0:POKE252,192  EA
•298 POKE782,A/256:POKE781,A-PEEK(782)*25
6:SYS65496:END                          LL
•300 C=256*PEEK(54)+PEEK(53)-LEN(C$)    EK
•310 POKE780,LEN(C$):POKE782,C/256:POKE78
1,C-256*PEEK(782):SYS65469              EO
•320 POKE780,1:POKE781,B:POKE782,1:SYS654
66:RETURN                               CK
```

STREAMER FONT
FROM PAGE 28

Beginning address in hex: 0801
Ending address in hex: 1840
SYS to start: 2061

MAIN PROGRAM

```
0801: 0B 08 0A 00 9E 32 30 36 55
0809: 31 00 00 00 AD AA 16 D0 79
0811: 08 20 91 0D A9 01 8D AA BA
0819: 16 A9 80 8D 8A 02 8D 91 92
0821: 02 A9 D8 85 FD A9 00 8D 60
0829: 15 D0 8D 7B 18 8D 76 18 4C
0831: A9 0B 8D 20 D0 8D 21 D0 E3
0839: A0 F0 A9 CF 99 FF 03 99 7A
0841: EF 04 99 DF 05 99 CF 06 23
0849: A9 00 99 FF D7 99 EF D8 C6
0851: 99 DF D9 99 CF DA 88 D0 42
0859: E1 A9 B9 85 FC A9 17 85 67
0861: FD 20 41 12 20 4A 12 A9 F8
0869: 0C 8D E7 DB A9 A0 8D E7 86
0871: 07 A0 00 B9 1D 18 99 80 22
0879: 3E C8 C0 20 D0 F5 A9 00 D1
0881: 99 80 3E C8 C0 40 D0 F8 6D
0889: A9 FA 8D FB 07 A9 08 8D FD
```

```
0891: 17 D0 8D 1D D0 8D 27 D0 7A
0899: A9 07 8D 2A D0 A9 18 8D 22
08A1: 06 D0 A9 DC 8D 05 D0 8D EF
08A9: 07 D0 A9 19 8D 04 D0 A9 50
08B1: DD 8D 05 D0 A0 00 8C 29 49
08B9: D0 B9 E6 17 99 C0 3E C8 A3
08C1: C0 1D D0 F5 A9 00 99 C0 6A
08C9: 3E C8 C0 40 D0 F8 A9 18 5D
08D1: 8D 00 D0 A9 32 8D 01 D0 6B
08D9: A9 02 8D 98 16 A9 FB 8D F4
08E1: F8 07 A0 00 B9 03 18 99 F0
08E9: 00 3F C8 C0 1A D0 F5 A9 3D
08F1: 04 8D 99 16 A9 00 8D 10 7A
08F9: D0 99 00 3F C8 C0 40 D0 3E
0901: F8 A9 15 8D 02 D0 A9 F1 B4
0909: 8D 03 D0 A9 06 8D 28 D0 A0
0911: A9 FC 8D F9 07 20 25 12 9D
0919: CE 9B 16 D0 F8 A9 05 8D 9F
0921: 97 16 A9 03 8D 15 D0 20 0F
0929: 57 12 4C 0D 0B AD 00 DC 81
0931: 49 FF 8D 74 18 29 10 C9 97
0939: 10 F0 2C A9 00 8D 7A 18 30
0941: 20 E0 0A AD 74 18 29 03 B2
0949: C9 01 F0 24 C9 02 F0 23 09
0951: AD 74 18 29 0C C9 04 F0 7F
0959: 14 C9 08 F0 0D AD 74 18 77
0961: 29 03 D0 C9 4C 77 09 4C 41
0969: 9A 0C 4C F0 0B 4C 48 0C F8
0971: 4C 98 0B 4C BA 0B 20 E4 78
0979: FF C9 9D F0 74 C9 1D F0 1E
0981: 6A C9 85 90 04 C9 8D 90 B7
0989: 6E C9 5F F0 6D C9 13 F0 4D
0991: 75 C9 30 90 04 C9 3A 90 2A
0999: 70 C9 41 90 04 C9 5B 90 5F
09A1: 6B C9 C4 F0 6A C9 D2 F0 84
09A9: 54 C9 CD F0 53 C9 2D F0 C1
09B1: 4F C9 C6 F0 4E C9 5C F0 E7
09B9: 4A C9 CC F0 55 C9 D3 F0 6F
09C1: 54 C9 D6 F0 53 C9 21 F0 D6
09C9: 52 C9 22 F0 51 C9 23 F0 28
09D1: 50 C9 24 F0 4F C9 25 F0 30
09D9: 4E C9 D8 F0 4D C9 93 F0 57
09E1: 4C C9 14 F0 4B 20 07 15 84
09E9: 4C 2E 09 20 1E 13 4C 2E 39
09F1: 09 20 EC 12 4C 2E 09 4C E9
09F9: 3F 0A 4C 34 0A 4C 7C 16 AC
0A01: 4C 16 11 4C 51 11 4C B4 24
0A09: 12 4C 50 0B 4C F9 0A 4C 5F
0A11: 8D 0B 4C 60 0E 4C DF 0D 9D
0A19: 4C DD 15 4C 73 0A 4C 88 F6
0A21: 0A 4C 9F 0A 4C B4 0A 4C 78
0A29: CB 0A 4C 32 0B 4C 73 12 5A
0A31: 4C D3 12 AD 7B 18 49 01 EE
0A39: 8D 7B 18 4C 2E 09 C9 85 2D
0A41: F0 1B C9 89 F0 1A C9 86 FB
0A49: F0 19 C9 8A F0 18 C9 87 02
0A51: F0 17 C9 8B F0 16 C9 88 08
0A59: F0 15 4C 63 13 4C 71 13 F2
0A61: 4C 98 13 4C BF 13 4C F2 B7
0A69: 13 4C 23 0F 4C 8D 11 4C 32
0A71: 50 13 A9 01 8D AB 16 8D 5C
0A79: AC 16 A9 32 8D A8 16 A9 0E
0A81: 38 8D A9 16 4C 2E 09 A9 34
0A89: 02 8D AB 16 A9 01 8D AC BF
0A91: 16 A9 31 8D A8 16 A9 36 AE
0A99: 8D A9 16 4C 2E 09 A9 02 16
0AA1: 8D AB 16 8D AC 16 A9 31 1C
0AA9: 8D A8 16 A9 36 8D A9 16 23
0AB1: 4C 2E 09 A9 03 8D AB 16 31
0AB9: A9 02 8D AC 16 A9 30 8D 1D
0AC1: A8 16 A9 34 8D A9 16 4C F7
0AC9: 2E 09 A9 03 8D AB 16 8D 8A
0AD1: AC 16 A9 30 8D A8 16 A9 64
0AD9: 34 8D A9 16 4C 2E 09 AE 8D
0AE1: 98 16 AC 27 D0 8C 98 16 70
0AE9: 8E 27 D0 AE 99 16 AC 28 A3
0AF1: D0 8C 99 16 8E 28 D0 60 E6
0AF9: 38 E9 40 8D 76 18 38 E9 9A
0B01: 01 0A 0A 0A 69 15 8D 75 A1
0B09: 18 4C 17 0B A9 01 8D 76 3E
0B11: 18 A9 15 8D 75 18 A9 00 AC
0B19: 8D 7F 18 20 EC 12 A9 32 39
0B21: 8D 01 D0 A9 00 8D 10 D0 98
0B29: AD 75 18 8D 02 D0 4C 2E 3F
0B31: 09 20 44 E5 A9 00 8D 15 D0
0B39: D0 8D 8A 02 8D 91 02 A9 EE
0B41: 0E 8D 86 02 8D 20 D0 A9 8D
0B49: 06 8D 21 D0 4C 74 A4 C9 FD
0B51: 30 F0 2C 38 E9 12 8D 76 D6
0B59: 18 38 E9 1F 0A 0A 0A 69 3A
0B61: 05 8D 75 18 A9 00 8D 7F 38
0B69: 18 20 EC 12 A9 32 8D 01 0B
0B71: D0 A9 02 8D 10 D0 AD 75 7F
0B79: 18 8D 02 D0 4C 2E 09 A9 1F
0B81: 1E 8D 76 18 A9 FD 8D 75 66
0B89: 18 4C 17 0B AD 15 D0 49 EC
0B91: 0C 8D 15 D0 4C 2E 09 A9 3E
0B99: 08 8D 9B 16 20 25 12 CE 07
0BA1: 01 D0 CE 9B 16 AD 9B 16 53
0BA9: D0 F2 AD 01 D0 C9 2A D0 B1
0BB1: 05 A9 EA 8D 01 D0 4C 51 48
0BB9: 09 AD 01 D0 C9 EA F0 27 0F
0BC1: A9 08 8D 9B 16 20 25 12 0A
0BC9: EE 01 D0 CE 9B 16 AD 9B 54
0BD1: 16 D0 F2 AD 01 D0 C9 F2 E7
0BD9: D0 05 A9 32 8D 01 D0 A9 94
0BE1: 00 8D 1B D0 4C 51 09 A9 AB
0BE9: 01 8D 1B D0 4C C1 0B A9 27
0BF1: 08 8D 9B 16 20 25 12 EE 7F
0BF9: 00 D0 AD 00 D0 F0 13 C9 17
0C01: B4 F0 39 CE 9B 16 D0 EC 1E
0C09: AD 00 D0 C9 58 F0 0E 4C F4
0C11: 2E 09 AD 10 D0 49 01 8D AE
0C19: 10 D0 4C 04 0C AD 10 D0 E4
0C21: 29 01 F0 15 AD 10 D0 49 29
0C29: 01 8D 10 D0 A9 B8 8D 00 88
```

```
0C31: D0 A9 01 8D 82 18 20 1E 13
0C39: 13 4C 2E 09 A9 01 8D 82 8A
0C41: 18 20 1E 13 4C 04 0C A9 B0
0C49: 08 8D 9B 16 20 25 12 CE B6
0C51: 00 D0 AD 00 D0 C9 FF F0 5B
0C59: 13 C9 B4 F0 31 CE 9B 16 8D
0C61: D0 EA AD 00 D0 C9 10 F0 66
0C69: 0E 4C 2E 09 AD 10 D0 49 D2
0C71: 01 8D 10 D0 4C 5E 0C AD 45
0C79: 10 D0 29 01 D0 0D A9 B0 BC
0C81: 8D 00 D0 A9 01 8D 82 18 B2
0C89: 20 EC 12 4C 2E 09 A9 01 D6
0C91: 8D 82 18 20 EC 12 4C 5E 83
0C99: 0C 20 3B 0D AD 7A 18 D0 1F
0CA1: 0C A9 01 8D 7A 18 A1 FC 17
0CA9: 49 04 8D 9A 16 AD 9A 16 93
0CB1: 81 FC AD 7B 18 D0 06 20 68
0CB9: 07 15 4C 41 09 AD 00 D0 EA
0CC1: F0 4E AD 10 D0 29 01 D0 8A
0CC9: 4C AD 00 D0 C9 64 90 12 65
0CD1: C9 B4 90 1C AD 7C 18 69 A8
0CD9: 1C 38 E5 FC 0A A8 C8 4C D8
0CE1: 33 0D AD 7C 18 69 09 38 0F
0CE9: E5 FC 0A A8 C8 4C 33 0D D4
0CF1: 38 A5 FC E9 09 38 ED 7C 62
0CF9: 18 0A 8D 78 18 38 A5 FC 15
0D01: ED 78 18 85 FC A5 FD E9 8F
0D09: 00 85 FD A0 01 4C 33 0D BA
0D11: A0 01 4C 33 0D 38 A5 FC 1A
0D19: E9 1D 38 ED 7C 18 0A 8D 72
0D21: 78 18 38 A5 FC ED 78 18 0B
0D29: 85 FC A5 FD E9 00 85 FD BC
0D31: A0 01 AD 9A 16 91 FC 4C 0C
0D39: B8 0C 38 AD 01 D0 E9 31 D0
0D41: 4A 4A 4A 8D 71 18 0A 0A 4B
0D49: 6D 71 18 A2 00 8E 71 18 FA
0D51: 0A 0A 2E 71 18 0A 2E 71 C6
0D59: 18 85 FC 8D 7C 18 AD 71 35
0D61: 18 69 D8 85 FD AD 10 D0 CD
0D69: 8D 73 18 38 AD 00 D0 E9 23
0D71: 17 8D 72 18 AD 73 18 E9 C3
0D79: 00 4A 6E 72 18 AD 72 18 F4
0D81: 4A 4A 8D 7E 18 65 FC 85 22
0D89: FC A5 FD 69 00 85 FD 60 77
0D91: A9 00 85 FE A2 28 AD E4 1D
0D99: 17 85 FF A0 00 A9 00 91 12
0DA1: FE C8 C0 40 D0 F7 18 A5 F0
0DA9: FE 69 40 85 FE A5 FF 69 E5
0DB1: 00 85 FF CA D0 E5 60 20 39
0DB9: C3 FF 20 CC FF 20 41 12 DD
0DC1: A9 17 85 FD A9 3C 85 FC 6E
0DC9: 20 4A 12 20 E4 FF F0 FB 38
0DD1: 20 57 12 AD 15 D0 49 03 3B
0DD9: 8D 15 D0 4C 2E 09 20 2F 20
0DE1: 12 AD 15 D0 49 03 8D 15 76
0DE9: D0 20 41 12 A9 17 85 FD 72
0DF1: A9 2A 85 FC 20 4A 12 20 E4
0DF9: DC 0E AD 3E 18 F0 4F AD D6
0E01: E5 17 8D FA 07 A9 01 8D C5
0E09: 3D 18 20 C4 0E A2 01 20 15
0E11: C9 FF A2 28 A9 00 85 FE D3
0E19: AD E4 17 85 FF A0 00 B1 9A
0E21: FE 20 D2 FF C8 C0 40 D0 AD
0E29: F6 18 A5 FE 69 40 85 FE 0B
0E31: A5 FF 69 00 85 FF EE FA AF
0E39: 07 CA D0 E1 A9 01 20 C3 4C
0E41: FF 20 CC FF A5 90 C9 40 6E
0E49: F0 04 C9 00 D0 0E 20 57 5E
0E51: 12 AD 15 D0 49 03 8D 15 E5
0E59: D0 4C 0D 0B 4C B8 0D 20 C0
0E61: 2F 12 AD 15 D0 49 03 8D 10
0E69: 15 D0 20 41 12 A9 17 85 09
0E71: FD A9 33 85 FC 20 4A 12 4B
0E79: 20 DC 0E AD 3E 18 F0 CE 48
0E81: 38 AD E5 17 E9 01 8D FA D7
0E89: 07 A9 00 8D 3D 18 20 C4 02
0E91: 0E A2 01 20 C6 FF A2 28 F4
0E99: A9 00 85 FE AD E4 17 85 F6
0EA1: FF A0 00 20 E4 FF 91 FE D7
0EA9: C8 C0 40 D0 F6 18 A5 FE F7
0EB1: 69 40 85 FE A5 FF 69 00 EE
0EB9: 85 FF EE FA 07 CA D0 E1 AD
0EC1: 4C 3D 0E AD 3E 18 A0 18 16
0EC9: A2 3F 20 BD FF A9 01 A2 D6
0ED1: 08 AC 3D 18 20 BA FF 20 D6
0ED9: C0 FF 60 A9 00 8D 3E 18 88
0EE1: 20 E4 FF F0 FB C9 0D F0 9B
0EE9: 1C C9 14 F0 19 C9 20 90 68
0EF1: EF C9 5B B0 EB AC 3E 18 A6
0EF9: 99 3F 18 20 D2 FF EE 3E 0B
0F01: 18 C0 0F D0 DB 60 AD 3E E1
0F09: 18 C9 00 F0 D3 A9 9D 20 17
0F11: D2 FF A9 20 20 D2 FF A9 4A
0F19: 9D 20 D2 FF CE 3E 18 4C 1B
0F21: E1 0E AD 15 D0 49 03 8D 7E
0F29: 15 D0 AD 76 18 8D 73 18 64
0F31: 20 2F 12 20 41 12 A9 17 C6
0F39: 85 FD A9 84 85 FC 20 4A D7
0F41: 12 20 4C 10 AD 4F 18 F0 D5
0F49: 34 A9 04 A2 04 A0 00 20 92
0F51: BA FF 20 C0 FF A2 04 20 B3
0F59: C9 FF A5 90 C9 80 F0 20 B4
0F61: A0 00 8C 79 18 AC 79 18 5E
0F69: B9 50 18 C9 28 F0 14 20 A2
0F71: 9C 0F EE 79 18 AD 79 18 DC
0F79: CD 4F 18 D0 E8 4C 30 10 F4
0F81: 4C E7 10 AD AC 16 8D 77 3B
0F89: 18 A2 0E A9 0D 20 D2 FF FB
0F91: CA D0 F8 CE 77 18 D0 F1 47
0F99: 4C 73 0F 8D 76 18 20 D8 7D
0FA1: 14 A0 00 AD AC 16 C9 03 93
0FA9: F0 0C C9 02 F0 0E 4C C3 81
0FB1: 0F C0 3C D0 EE 60 20 C9 C7
0FB9: 0F 88 88 88 20 C9 0F 88 E3
0FC1: 88 88 20 C9 0F 4C B2 0F D9
0FC9: A9 10 20 D2 FF AD A8 16 E2
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0FD1: 20 D2 FF AD A9 16 20 D2 25
0FD9: FF 20 F3 0F 20 F3 0F 20 40
0FE1: F3 0F A9 08 20 D2 FF A9 33
0FE9: 0D 20 D2 FF A9 0F 20 D2 95
0FF1: FF 60 A2 08 AD AB 16 8D F9
0FF9: 72 18 B1 FE 3D 9C 16 F0 16
1001: 1B AD AD 16 20 D2 FF AD 2E
1009: A5 16 20 D2 FF CE 72 18 11
1011: D0 F5 CA D0 DF 20 E1 FF 55
1019: F0 15 C8 60 A9 92 20 D2 77
1021: FF AD A7 16 20 D2 FF CE 4E
1029: 72 18 D0 F5 4C 13 10 A9 93
1031: 04 20 C3 FF 20 CC FF 20 26
1039: 57 12 AD 73 18 8D 76 18 F7
1041: AD 15 D0 49 03 8D 15 D0 94
1049: 4C 2E 09 A9 00 8D 4F 18 6B
1051: 8D 8A 02 20 E4 FF C9 0D 47
1059: F0 6A C9 14 F0 6C C9 20 D9
1061: F0 23 C9 21 F0 24 C9 24 63
1069: F0 25 C9 2A F0 26 C9 3F 93
1071: F0 27 C9 41 90 04 C9 5B 4E
1079: 90 24 C9 30 90 D5 C9 3A 92
1081: 90 25 4C 54 10 A2 28 4C FE
1089: B1 10 A2 1A 4C B1 10 A2 B8
1091: 1C 4C B1 10 A2 27 4C B1 83
1099: 10 A2 1B 4C B1 10 48 38 F5
10A1: E9 41 AA 68 4C B1 10 48 36
10A9: 38 E9 13 AA 68 4C B1 10 FF
10B1: AC 4F 18 20 D2 FF 8A 99 DC
10B9: 50 18 EE 4F 18 AD 4F 18 8D
10C1: C9 21 D0 8F A9 80 8D 8A 4F
10C9: 02 60 AD 4F 18 C9 00 F0 FB
10D1: 82 A9 9D 20 D2 FF A9 20 58
10D9: 20 D2 FF A9 9D 20 D2 FF 07
10E1: CE 4F 18 4C 54 10 A9 04 76
10E9: 20 C3 FF 20 CC FF 20 2F 0A
10F1: 12 20 41 12 A9 5C 85 FC FF
10F9: A9 17 85 FD 20 4A 12 20 DA
1101: E4 FF F0 FB AD 73 18 8D 99
1109: 76 18 A9 03 8D 15 D0 20 D7
1111: 57 12 4C 2E 09 20 27 16 5B
1119: A2 18 A0 00 8C 78 18 38 C9
1121: A9 13 ED 78 18 8D 71 18 73
1129: B1 FC 8D 77 18 AC 71 18 2B
1131: B1 FC AC 78 18 91 FC AC 58
1139: 71 18 AD 77 18 91 FC AC 3B
1141: 78 18 C8 C0 0A D0 D5 20 2C
1149: 3E 16 CA D0 CD 4C 2E 09 8A
1151: 20 27 16 18 AD 7F 18 69 75
1159: 98 85 FE A9 DB 85 FF A2 24
1161: 0C A0 00 B1 FE 8D 77 18 DB
1169: B1 FC 91 FE AD 77 18 91 77
1171: FC C8 C0 14 D0 ED 20 3E 29
1179: 16 38 A5 FE E9 28 85 FE 03
1181: A5 FF E9 00 85 FF CA D0 32
1189: D8 4C 2E 09 20 2F 12 20 67
1191: 41 12 AD 15 D0 49 03 8D 52
1199: 15 D0 A9 AE 85 FC A9 16 1A
11A1: 85 FD 20 4A 12 20 06 12 D9
11A9: C9 0D F0 4B 8D A5 16 A9 AF
11B1: C3 85 FC A9 16 85 FD 20 5B
11B9: 4A 12 A9 12 8D AD 16 20 43
11C1: E4 FF C9 59 F0 09 C9 4E DB
11C9: D0 F5 A9 92 8D AD 16 20 3E
11D1: 2F 12 20 41 12 A9 D4 85 8A
11D9: FC A9 16 85 FD 20 4A 12 96
11E1: 20 06 12 C9 0D F0 10 8D 7F
11E9: A7 16 A9 96 8D 9B 16 20 47
11F1: 25 12 CE 9B 16 D0 F8 AD 21
11F9: 15 D0 49 03 8D 15 D0 20 BF
1201: 57 12 4C 2E 09 20 E4 FF F2
1209: F0 FB C9 0D F0 0F C9 20 B6
1211: 90 F3 C9 A0 B0 04 C9 81 FF
1219: B0 EB 20 D2 FF 60 A0 DC 86
1221: 88 D0 FD 60 AE 97 16 20 55
1229: 1F 12 CA D0 FA 60 A0 28 1A
1231: A9 0B 99 BF DB A9 20 99 7E
1239: BF 07 88 C0 00 D0 F1 60 6C
1241: A2 18 A0 00 18 20 F0 FF C5
1249: 60 A0 00 B1 FC 20 D2 FF EB
1251: C8 C9 00 D0 F6 60 20 2F 5B
1259: 12 A9 8D 85 FC A9 17 85 6B
1261: FD 20 41 12 20 4A 12 A9 F8
1269: AA 8D E7 07 A9 0C 8D E7 BB
1271: DB 60 AD 15 D0 49 03 8D 1B
1279: 15 D0 20 2F 12 20 41 12 34
1281: A9 E8 85 FC A9 16 85 FD D9
1289: 20 4A 12 20 E4 FF F0 FB F7
1291: C9 59 D0 11 20 91 0D 20 75
1299: 57 12 AD 15 D0 49 03 8D 70
12A1: 15 D0 4C 0D 0B 20 57 12 75
12A9: AD 15 D0 49 03 8D 15 D0 FC
12B1: 4C 2E 09 A9 18 8D 00 D0 55
12B9: AD 10 D0 29 02 8D 10 D0 E1
12C1: AD 7F 18 F0 05 A9 B8 8D EC
12C9: 00 D0 A9 32 8D 01 D0 4C 22
12D1: 2E 09 20 27 16 A2 18 A0 C1
12D9: 13 A9 05 91 FC 88 C0 FF 73
12E1: D0 F7 20 3E 16 CA D0 EF AA
12E9: 4C 2E 09 20 C8 14 AD 82 9A
12F1: 18 D0 0D A9 18 8D 00 D0 08
12F9: AD 10 D0 29 02 8D 10 D0 22
1301: A9 00 8D 82 18 20 7C 14 83
1309: CE FA 07 AD 7F 18 D0 04 F3
1311: 20 BC 15 60 20 5A 16 A9 9D
1319: 00 8D 7F 18 60 20 B8 14 8B
1321: AD 82 18 D0 0D A9 B8 8D 37
1329: 00 D0 AD 10 D0 29 02 8D 41
1331: 10 D0 A9 00 8D 82 18 20 04
1339: 40 14 EE FA 07 AD 7F 18 C3
1341: F0 04 20 9D 15 60 20 5A E3
1349: 16 A9 14 8D 7F 18 60 A9 4C
1351: 83 85 FE A9 18 85 FF A9 4A
1359: 05 8D 81 18 20 59 15 4C 60
1361: 2E 09 A9 83 85 FE A9 18 0C
1369: 85 FF 20 0A 15 4C 2E 09 B1
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1371: 20 27 16 A2 18 A0 13 B1 EE
1379: FC 8D 77 18 88 B1 FC C8 93
1381: 91 FC 88 88 C0 FF D0 F5 A8
1389: C8 AD 77 18 91 FC 20 3E 7C
1391: 16 CA D0 E1 4C 2E 09 20 C8
1399: 27 16 A2 18 A0 00 B1 FC E0
13A1: 8D 77 18 C8 B1 FC 88 91 50
13A9: FC C8 C8 C0 14 D0 F5 88 5C
13B1: AD 77 18 91 FC 20 3E 16 F1
13B9: CA D0 E1 4C 2E 09 A0 13 6E
13C1: A2 17 18 20 31 16 B1 FC A9
13C9: 8D 77 18 20 4C 16 B1 FC 18
13D1: 8D 72 18 20 3E 16 AD 72 7E
13D9: 18 91 FC 20 32 14 CA D0 82
13E1: ED 20 3E 16 AD 77 18 91 13
13E9: FC 88 C0 FF D0 D2 4C 2E 4E
13F1: 09 A0 13 A2 17 20 27 16 C5
13F9: B1 FC 8D 77 18 20 3E 16 3A
1401: B1 FC 8D 72 18 20 4C 16 4A
1409: AD 72 18 91 FC 20 24 14 28
1411: CA D0 ED 20 4C 16 AD 77 42
1419: 18 91 FC 88 C0 FF D0 D3 AD
1421: 4C 2E 09 18 A5 FC 69 50 19
1429: 85 FC A5 FD 69 00 85 FD 3C
1431: 60 38 A5 FC E9 50 85 FC 29
1439: A5 FD E9 00 85 FD 60 A9 54
1441: 08 8D 77 18 EE 02 D0 AD D5
1449: 02 D0 F0 0F CE 77 18 D0 4B
1451: F3 AD 02 D0 C9 55 F0 0E E3
1459: 4C 7B 14 AD 10 D0 49 02 0F
1461: 8D 10 D0 4C 4D 14 AD 10 3B
1469: D0 29 02 F0 0D AD 10 D0 F1
1471: 49 02 8D 10 D0 A9 15 8D 77
1479: 02 D0 60 A9 08 8D 77 18 7B
1481: CE 02 D0 AD 02 D0 F0 0F A3
1489: CE 77 18 D0 F3 AD 02 D0 2D
1491: C9 0D F0 0E 4C B7 14 AD 2D
1499: 10 D0 49 02 8D 10 D0 4C 80
14A1: 89 14 AD 10 D0 29 02 D0 C9
14A9: 0D AD 10 D0 49 02 8D 10 2E
14B1: D0 A9 4D 8D 02 D0 60 EE 29
14B9: 76 18 AD 76 18 C9 28 D0 47
14C1: 05 A9 00 8D 76 18 60 CE BB
14C9: 76 18 AD 76 18 C9 FF D0 2F
14D1: 05 A9 27 8D 76 18 60 A9 CD
14D9: 00 8D 72 18 AD 76 18 0A 38
14E1: 0A 0A 2E 72 18 0A 2E 72 59
14E9: 18 0A 2E 72 18 0A 2E 72 6F
14F1: 18 85 FE 18 AD E4 17 6D BD
14F9: 72 18 85 FF AD 76 18 6D B3
1501: E5 17 8D FA 07 60 20 D8 E6
1509: 14 A0 00 8C 78 18 8C 77 DE
1511: 18 20 31 16 20 29 15 20 0F
1519: 29 15 20 29 15 EE 78 18 35
1521: AD 78 18 C9 14 D0 EA 60 59
1529: A2 08 A9 00 8D 72 18 AC 42
1531: 78 18 B1 FC 29 0F C9 01 73
1539: D0 09 AD 72 18 1D 9C 16 1B
1541: 8D 72 18 20 4C 16 CA D0 77
1549: E9 AD 72 18 AC 77 18 91 39
1551: FE EE 77 18 60 20 D8 14 3C
1559: A0 00 8C 78 18 8C 77 18 33
1561: 20 31 16 20 78 15 20 78 0F
1569: 15 20 78 15 EE 78 18 AD 59
1571: 78 18 C9 14 D0 EA 60 A2 9E
1579: 08 AD 81 18 AC 78 18 91 97
1581: FC AC 77 18 B1 FE 3D 9C 45
1589: 16 F0 07 AC 78 18 A9 01 7F
1591: 91 FC 20 4C 16 CA D0 E1 20
1599: EE 77 18 60 A9 00 8D 7F 2F
15A1: 18 8D 81 18 20 C8 14 20 FD
15A9: 56 15 A9 14 8D 7F 18 A9 A1
15B1: 05 8D 81 18 20 B8 14 20 EA
15B9: 56 15 60 A9 14 8D 7F 18 68
15C1: A9 00 8D 81 18 20 B8 14 7F
15C9: 20 56 15 A9 05 8D 81 18 2B
15D1: A9 00 8D 7F 18 20 C8 14 9D
15D9: 20 56 15 60 20 2F 12 AD D4
15E1: 15 D0 49 03 8D 15 D0 20 A7
15E9: 41 12 A0 00 B9 11 17 C9 89
15F1: 00 F0 07 20 D2 FF C8 4C F1
15F9: ED 15 20 E4 FF C9 00 F0 BC
1601: F9 C9 30 90 F5 C9 3A B0 30
1609: F1 38 E9 2F 8D 97 16 38 BF
1611: A9 0B ED 97 16 8D 97 16 9C
1619: AD 15 D0 49 03 8D 15 D0 6C
1621: 20 57 12 4C 2E 09 AD 7F 5B
1629: 18 85 FC A9 D8 85 FD 60 2A
1631: 18 AD 7F 18 69 98 85 FC 13
1639: A9 DB 85 FD 60 18 A5 FC 5D
1641: 69 28 85 FC A5 FD 69 00 62
1649: 85 FD 60 38 A5 FC E9 28 1A
1651: 85 FC A5 FD E9 00 85 FD E4
1659: 60 A9 D7 85 FD A9 FF 85 ED
1661: FC A2 18 A0 28 B1 FC 29 B9
1669: 0F C9 01 F0 04 49 05 91 18
1671: FC 88 D0 F1 20 3E 16 CA F8
1679: D0 E9 60 20 27 16 A2 18 AC
1681: A0 13 B1 FC 49 04 91 FC BF
1689: 88 C0 FF D0 F5 20 3E 16 0E
1691: CA D0 ED 4C 2E 09 0C 00 AA
1699: 00 00 FF 00 01 02 04 08 A8
16A1: 10 20 40 80 23 00 20 32 08
16A9: 38 00 01 01 92 98 20 46 75
16B1: 4F 52 45 47 52 4F 55 4E 25
16B9: 44 20 43 48 41 52 2E 3E A9
16C1: 9F 00 98 20 52 45 56 45 4D
16C9: 52 53 45 3F 20 28 59 2F C4
16D1: 4E 29 00 20 42 41 43 4B 7B
16D9: 47 52 4F 55 4E 44 20 43 0E
16E1: 48 41 52 2E 3E 9F 00 9E 68
16E9: 20 20 20 20 12 20 43 4C 2C
16F1: 45 41 52 20 46 4F 4E 54 23
16F9: C0 C0 41 52 45 20 59 4F 1D
1701: 55 20 53 55 52 45 3F 20 16
1709: 28 59 2F 4E 29 20 92 00 E3
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1711: 98 20 43 55 52 53 4F 52 A9
1719: 20 56 45 4C 4F 43 49 54 51
1721: 59 20 28 30 2D 39 29 20 A2
1729: 00 98 20 53 41 56 45 3E 50
1731: 9F 00 98 20 4C 4F 41 44 AA
1739: 3E 9F 00 9E 20 20 20 20 36
1741: 12 20 3C 3C 3C 3C 3C 20 C0
1749: 44 49 53 4B 20 45 52 52 7F
1751: 4F 52 20 3E 3E 3E 3E 3E 4A
1759: 20 92 00 9E 20 20 20 20 2B
1761: 12 20 3C 3C 3C 3C 3C 20 E0
1769: 44 45 56 49 43 45 20 4E 89
1771: 4F 54 20 50 52 45 53 45 B5
1779: 4E 54 20 3E 3E 3E 3E 3E 73
1781: 20 92 00 98 50 52 49 4E 07
1789: 54 3E 9F 00 98 12 41 42 E9
1791: 43 44 45 46 47 48 49 4A C7
1799: 4B 4C 4D 4E 4F 50 51 52 10
17A1: 53 54 55 56 57 58 59 5A 58
17A9: 21 3F 24 30 31 32 33 34 29
17B1: 35 36 37 38 39 92 91 00 E9
17B9: 98 12 20 20 20 20 20 20 25
17C1: 53 54 52 45 41 4D 45 52 27
17C9: 20 46 4F 4E 54 20 20 42 A4
17D1: 59 20 42 4F 42 20 53 50 E2
17D9: 49 52 4B 4F 20 20 20 20 90
17E1: 20 92 00 20 80 7F 80 00 35
17E9: FF C0 00 C0 C0 00 C0 C0 AD
17F1: 00 C0 C0 00 C0 C0 00 C0 B5
17F9: C0 00 C0 C0 00 FF C0 00 FC
1801: 7F 80 1F E0 00 30 30 00 61
1809: 60 18 00 60 18 00 60 18 72
1811: 00 60 18 00 60 18 00 30 32
1819: 30 00 1F E0 FF F8 00 FF 42
1821: F8 00 FF F8 00 FF F8 00 0C
1829: FF F8 00 FF F8 00 FF F8 14
1831: 00 FF F8 00 FF F8 00 FF 23
1839: F8 00 FF F8 FF FF FF 00 2B
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Beginning address in hex: 2000
Ending address in hex: 29FF

SEQUELA

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2000: 80 00 00 E0 00 00 FC 00 5E
2008: 00 FF 80 00 FF F0 00 9F 19
2010: FE 00 03 FF C0 03 7F F9 4F
2018: 03 0F FF 03 01 FF 03 00 31
2020: 7F 03 07 F9 03 3F C0 03 A9
2028: FE 00 8F F0 00 FF 80 00 28
2030: FC 00 00 E0 00 00 80 00 8E
2038: 00 00 00 00 00 00 00 00 38
2040: 00 00 00 80 00 01 FF FF C1
2048: FF FF FF FF FF FF FF FF 48
2050: FF FF C0 18 03 C0 18 03 08
2058: C0 18 03 C0 18 03 C0 18 E8
2060: 03 C0 18 03 C0 18 03 E0 FB
2068: 3C 07 F0 7E 0F 7F FF FE A8
2070: 7F F7 FE 3F E3 FC 0F 80 96
2078: F0 00 00 00 00 00 00 00 69
2080: 00 00 00 0F FF F0 3F FF BF
2088: FC 7F FF FE 7F FF FE F0 73
2090: 00 0F E0 00 07 C0 00 03 4B
2098: C0 00 03 C0 00 03 C0 00 E0
20A0: 03 C0 00 03 C0 00 03 E0 0C
20A8: 00 07 F1 00 8F 7F 00 FE AF
20B0: 7F 00 FE 3F 00 FC 0F 00 7A
20B8: F8 00 00 00 00 00 00 00 B1
20C0: 00 00 00 80 00 01 FF FF 42
20C8: FF FF FF FF FF FF FF FF C8
20D0: FF FF E0 00 03 E0 00 03 98
20D8: E0 00 03 E0 00 03 E0 00 81
20E0: 03 E0 00 03 E0 00 03 F0 9C
20E8: 00 07 F8 00 0F 7F FF FE 76
20F0: 7F FF FE 3F FF FC 0F FF BA
20F8: F0 00 00 00 00 00 00 00 E9
2100: 00 00 00 80 00 01 FF FF 81
2108: FF FF FF FF FF FF FF FF 08
2110: FF FF C0 18 03 C0 18 03 C7
2118: C0 18 03 C0 18 03 C0 18 A8
2120: 03 C0 18 03 C0 18 03 C0 9B
2128: 18 03 C0 3C 03 C0 00 03 07
2130: C0 00 03 E0 00 07 70 00 4C
2138: 0E 00 00 00 00 00 00 00 46
2140: 00 00 00 80 00 01 FF FF C1
2148: FF FF FF FF FF FF FF FF 48
2150: FF FF 80 18 03 00 18 03 07
2158: 00 18 03 00 18 03 00 18 A6
2160: 03 00 18 03 00 18 03 00 99
2168: 18 03 00 3C 03 00 00 03 C5
2170: 00 00 03 00 00 07 00 00 7A
2178: 0E 00 00 00 00 00 00 00 86
2180: 00 00 00 0F FF F0 3F FF BF
2188: FC 7F FF FE 7F FF FE F0 73
2190: 00 0F E0 00 07 C0 00 03 4B
2198: C0 00 03 C0 00 03 C0 00 E0
21A0: 03 C0 60 03 C0 60 03 E0 CC
21A8: 60 07 F0 60 8F 7F E0 FE 50
21B0: 7F E0 FE 3F E0 FC 0F E0 1D
21B8: F0 00 00 00 00 00 00 00 A9
21C0: 00 00 00 80 00 01 FF FF 42
21C8: FF FF FF FF FF FF FF FF C8
21D0: FF FF 80 18 01 00 18 00 82
21D8: 00 18 00 00 18 00 00 18 21
21E0: 00 00 18 00 00 18 00 80 91
21E8: 18 01 FF FF FF FF FF FF 02
21F0: FF FF FF FF FF FF 80 00 71
21F8: 01 00 00 00 00 00 00 00 F9
2200: 00 00 00 00 00 00 00 00 00
2208: 00 00 00 00 00 00 00 00 08
2210: 00 00 00 00 00 80 00 01 91
2218: FF FF FF FF FF FF FF FF 18
2220: FF FF FF FF 80 00 01 00 A1
2228: 00 00 00 00 00 00 00 00 28
2230: 00 00 00 00 00 00 00 00 30
2238: 00 00 00 00 00 00 00 00 38
2240: 00 00 00 0E 00 00 3E 00 8C
2248: 00 7E 00 00 7E 00 00 F2 38
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2250: 00 00 E0 00 00 C0 00 00 F1
2258: C0 00 00 C0 00 00 C0 00 9A
2260: 00 E0 00 00 F0 00 01 7F B2
2268: FF FF 7F FF FF 3F FF FF 27
2270: 0F FF FF 00 00 01 00 00 80
2278: 00 00 00 00 00 00 00 00 78
2280: 00 00 00 80 00 01 FF FF 02
2288: FF FF FF FF FF FF FF FF 88
2290: FF FF 80 FE 01 01 F7 00 0A
2298: 03 E3 80 07 C1 C0 0F 80 19
22A0: E0 1F 00 70 3E 00 38 7C 04
22A8: 00 1C F8 00 0E F0 00 07 C3
22B0: E0 00 03 C0 00 01 80 00 D6
22B8: 00 00 00 00 00 00 00 00 B8
22C0: 00 00 00 80 00 01 FF FF 42
22C8: FF FF FF FF FF FF FF FF C8
22D0: FF FF C0 00 01 C0 00 00 53
22D8: C0 00 00 C0 00 00 C0 00 1B
22E0: 00 C0 00 00 C0 00 00 C0 23
22E8: 00 00 C0 00 00 C0 00 00 6A
22F0: C0 00 00 E0 00 00 F0 00 83
22F8: 00 00 00 00 00 00 00 00 F8
2300: 80 00 01 FF FF FF FF FF 81
2308: FF FF FF FF FF FF FF 80 88
2310: 00 7F 00 01 FC 00 07 F0 85
2318: 00 1F C0 00 7F 00 00 1F 96
2320: C0 00 07 F0 00 01 FC 80 57
2328: 00 7F FF FF FF FF FF FF A7
2330: FF FF FF FF FF FF 80 00 B0
2338: 01 00 00 00 00 00 00 00 39
2340: 00 00 00 80 00 01 FF FF C1
2348: FF FF FF FF FF FF FF FF 48
2350: FF FE 80 00 F8 00 03 E0 AC
2358: 00 0F 80 00 3E 00 00 F8 1F
2360: 00 03 E0 00 0F 80 00 3E 12
2368: 00 01 FF FF FF FF FF FF 69
2370: FF FF FF FF FF FF 00 00 70
2378: 01 00 00 00 00 00 00 00 79
2380: 00 00 00 0F FF F0 3F FF BF
2388: FC 7F FF FE 7F FF FE F0 73
2390: 00 0F E0 00 07 C0 00 03 4B
2398: C0 00 03 C0 00 03 C0 00 E0
23A0: 03 C0 00 03 C0 00 03 E0 0C
23A8: 00 07 F0 00 0F 7F FF FE 2E
23B0: 7F FF FE 3F FF FC 0F FF 7A
23B8: F0 00 00 00 00 00 00 00 A9
23C0: 00 00 00 80 00 01 FF FF 42
23C8: FF FF FF FF FF FF FF FF C8
23D0: FF FF 80 18 03 00 18 03 87
23D8: 00 18 03 00 18 03 00 18 27
23E0: 03 00 18 03 00 18 03 00 1A
23E8: 1C 07 00 1E 0F 00 0F FE 47
23F0: 00 0F FE 00 07 FC 00 03 06
23F8: F0 00 00 00 00 00 00 00 E9
2400: 00 00 00 0F FF F0 3F FF 3F
2408: FC 7F FF FE 7F FF FE F0 F2
2410: 00 0F E0 00 07 C0 00 03 CA
2418: C0 00 03 C4 00 03 CC 00 70
2420: 03 DC 00 03 F8 00 03 F0 EF
2428: 00 07 70 00 0F FF FF FE AD
2430: FF FF FE BF FF FC 0F FF FA
2438: F0 00 00 00 00 00 00 00 29
2440: 00 00 00 80 00 01 FF FF C1
2448: FF FF FF FF FF FF FF FF 48
2450: FF FF 80 18 03 00 18 03 07
2458: 00 18 03 00 38 03 00 F8 A7
2460: 03 03 F8 03 0F D8 03 3F 8C
2468: 1C 07 FC 1E 0F F0 0F FE B4
2470: E0 0F FE C0 07 FC 80 03 A7
2478: F0 00 00 00 00 00 00 00 69
2480: 00 00 00 7F 01 F0 3C 07 35
2488: FC 78 0F FE 70 0F FE E0 6B
2490: 1F 0F E0 1E 07 C0 1C 03 A4
2498: C0 1C 03 C0 1C 03 C0 38 51
24A0: 03 C0 38 03 E0 38 03 E0 9C
24A8: 78 07 F0 F8 07 7F F0 0E 97
24B0: 7F F0 1E 3F E0 3C 0F 80 2B
24B8: FE 00 00 00 00 00 00 00 B7
24C0: 00 00 00 00 00 0F 00 00 CF
24C8: 07 00 00 03 00 00 03 00 D5
24D0: 00 03 00 00 03 80 00 03 5A
24D8: FF FF FF FF FF FF FF FF D8
24E0: FF FF FF FF 80 00 03 00 64
24E8: 00 03 00 00 03 00 00 03 F1
24F0: 00 00 03 00 00 07 00 00 FA
24F8: 0F 00 00 00 00 00 00 00 08
2500: 00 00 00 00 00 01 0F FF 10
2508: FF 3F FF FF 7F FF FF 7F 46
2510: FF FF F0 00 01 E0 00 00 E2
2518: C0 00 00 C0 00 00 C0 00 5A
2520: 00 C0 00 00 C0 00 00 60 02
2528: 00 00 78 00 01 3F FF FF E0
2530: 1F FF FF 07 FF FF 00 00 56
2538: 01 00 00 00 00 00 00 00 39
2540: 00 00 01 00 00 07 00 00 48
2548: 3F 00 01 FF 00 0F FF 00 97
2550: 7F F9 03 FF C0 9F FE 00 2C
2558: FF F0 00 FF 80 00 FE 00 C8
2560: 00 9F E0 00 03 FC 00 00 E0
2568: 7F 80 00 0F F1 00 01 FF 6A
2570: 00 00 3F 00 00 07 00 00 B6
2578: 01 00 00 00 00 00 00 00 79
2580: 00 00 01 00 00 7F 00 3F 40
2588: FF 1F FF FF FF FF FF FF A7
2590: FF 81 FF C0 00 3F 00 00 12
2598: 0F F0 00 03 FC 00 0F F0 98
25A0: 00 3F 00 00 FF C0 00 FF A0
25A8: FF 81 FF FF FF 1F FF FF 49
25B0: 00 3F FF 00 00 7F 00 00 6F
25B8: 01 00 00 00 00 00 00 00 B9
25C0: 80 00 01 C0 00 07 F0 00 FA
25C8: 1F FC 00 7F FF 01 FF 1F 84
25D0: C7 F9 07 FF E0 01 FF 80 FB
25D8: 00 7E 00 00 3C 00 00 7E 12
25E0: 00 01 FF 80 07 FF E0 9F E9
25E8: E3 F9 FF 80 FF FE 00 3F 85
```

```
25F0: F8 00 0F E0 00 03 80 00 5D
25F8: 01 00 00 00 00 00 00 00 F9
2600: 00 00 00 00 00 01 00 00 01
2608: 07 00 00 1F 00 00 7F 00 AD
2610: 01 FF 00 03 F9 80 0F E0 7E
2618: FF FF 80 FF FE 00 FF FC 94
2620: 00 FF FE 00 80 0F 80 00 2F
2628: 03 E0 00 00 F9 00 00 3F 45
2630: 00 00 0F 00 00 03 00 00 42
2638: 01 00 00 00 00 00 00 00 39
2640: 00 00 00 FC 00 0F FE 00 4B
2648: 07 FF 00 03 FF 80 03 C7 9D
2650: C0 03 C3 E0 03 C1 F0 03 71
2658: C0 F8 03 C0 7C 03 C0 3E 54
2660: 03 C0 1F 03 C0 0F 83 C0 5A
2668: 07 C3 C0 03 E3 C0 01 FF 9C
2670: C0 00 FF E0 00 7F F0 00 82
2678: 3F 00 00 00 00 00 00 00 B7
2680: 00 00 00 00 00 00 00 00 80
2688: 00 00 00 00 00 00 00 00 88
2690: 00 00 00 00 00 00 0F F8 98
2698: 40 7F FE E7 FF FF E7 FF 27
26A0: FF 40 7F FE 00 0F F8 00 67
26A8: 00 00 00 00 00 00 00 00 A8
26B0: 00 00 00 00 00 00 00 00 B0
26B8: 00 00 00 00 00 00 00 00 B8
26C0: 00 00 00 00 00 00 00 00 C0
26C8: 78 00 00 FC 00 00 8E 00 CC
26D0: 01 C6 00 01 C7 01 80 C3 A6
26D8: 43 C0 03 E3 E0 03 E6 60 EE
26E0: 03 40 30 03 00 30 07 00 8E
26E8: 18 07 00 1C 0E 00 0F FE 40
26F0: 00 07 FC 00 01 F0 00 00 E6
26F8: 00 00 00 00 00 00 00 00 F8
2700: 00 00 00 07 01 C0 0F 87 5F
2708: F0 1C 8F F8 18 0E 38 38 34
2710: 1C 1C 30 1C 1C FF FF FF B0
2718: FF FF FF 30 18 0C 30 18 B4
2720: 0C FF FF FF FF FF FF 38 64
2728: 38 0C 38 38 1C 1C 70 18 9D
2730: 1F F1 38 0F E1 F0 03 80 DE
2738: E0 00 00 00 00 00 00 00 19
2740: 00 00 00 0F FF F0 3F FF 7F
2748: FC 7F FF FE 7F FF FE FB 3E
2750: C0 1F F1 E0 0F E0 F0 07 EA
2758: E0 78 07 E0 3C 07 E0 1E DB
2760: 07 E0 0F 07 E0 07 87 F0 BE
2768: 03 CF F8 01 FF 7F FF FE B3
2770: 7F FF FE 3F FF FC 0F FF 3A
2778: F0 00 00 00 00 00 00 00 69
2780: 00 00 00 00 00 00 00 00 80
2788: 00 00 00 00 00 00 00 00 88
2790: 00 00 C0 00 18 C0 00 18 42
2798: FF FF FC FF FF FE FF FF 94
27A0: FF FF FF FF C0 00 00 C0 22
27A8: 00 00 00 00 00 00 00 00 A8
27B0: 00 00 00 00 00 00 00 00 B0
27B8: 00 00 00 00 00 00 00 00 B8
27C0: 00 00 00 F8 00 78 FC 00 2F
27C8: FC FE 00 FE FF 00 FE FF C2
27D0: 80 9E E7 C0 0F E3 C0 07 53
27D8: E1 E0 07 E0 F0 07 E0 F0 4D
27E0: 07 E0 78 07 E0 38 07 E0 49
27E8: 3C 0F E0 1E 1F E0 1F FE 51
27F0: E0 0F FE F0 07 FC F8 01 CE
27F8: F8 00 00 00 00 00 00 00 F1
2800: 00 00 00 1E 00 1F 3F 00 7C
2808: 0F 7F 00 07 7F 00 07 F9 1E
2810: 00 07 F0 00 07 E0 00 07 F6
2818: E0 08 07 E0 0C 07 E0 0E EA
2820: 07 E0 1F 07 E0 1F 87 F0 A6
2828: 3F C7 F8 79 E7 7F F8 F7 F9
2830: 7F F0 7F 3F E0 3F 1F 80 1F
2838: 1F 00 00 00 00 00 00 00 57
2840: 00 00 00 04 00 00 07 00 4B
2848: 00 07 C0 00 07 E0 00 06 FD
2850: F8 00 06 3E 00 06 0F 80 23
2858: 06 03 E0 06 00 F8 06 00 47
2860: 3C 86 00 0F FF FF FF FF 32
2868: FF FF FF FF FF FF FF FF 68
2870: 86 00 00 06 00 00 06 00 03
2878: 00 00 00 00 00 00 00 00 78
2880: 00 00 00 1E 07 FF 3F 07 EB
2888: FF 7F 07 FF 7F 07 FF F9 8F
2890: 07 07 F0 07 07 E0 07 07 8C
2898: E0 07 07 E0 07 07 E0 07 5E
28A0: 07 E0 07 07 E0 07 07 F0 76
28A8: 0F 07 F8 1F 07 7F FE 07 63
28B0: 7F FE 07 3F FC 0F 1F F0 91
28B8: 1F 00 00 00 00 00 00 00 D7
28C0: 00 00 00 0F FF F0 3F FF FF
28C8: FC 7F FF FE 7F FF FE F8 BB
28D0: 78 1F F0 38 0F E0 1C 07 A4
28D8: E0 1C 07 E0 1C 07 E0 1C DD
28E0: 07 E0 1C 07 E0 1C 07 F0 E0
28E8: 3C 0F F8 7C 3F 7F F8 3E 9F
28F0: 7F F8 3E 3F F0 3C 0F C0 E3
28F8: 30 00 00 00 00 00 00 00 29
2900: 00 00 00 00 00 1F 00 00 1F
2908: 0F 00 00 07 00 00 07 70 95
2910: 00 07 FC 00 07 FF 00 07 22
2918: FF C0 07 FF E0 07 8F F0 48
2920: 07 01 FC 07 00 7E 07 00 B1
2928: 3F 87 00 0F E7 00 03 FF E8
2930: 00 00 FF 00 00 3F 00 00 6F
2938: 1F 00 00 00 00 00 00 00 57
2940: 00 00 00 0F 80 F0 3F E3 E3
2948: FC 7F F7 FE 7F FF FE F8 33
2950: 7F 1F F0 3E 0F E0 1C 07 31
2958: E0 1C 07 E0 1C 07 E0 1C 5D
2960: 07 E0 1C 07 E0 1C 07 F0 60
2968: 3E 0F F8 7F 1F 7F FF FE CB
2970: 7F F7 FE 3F E3 FC 0F 80 96
2978: F0 00 00 00 00 00 00 00 69
2980: 00 00 00 0C 03 F0 3C 0F CB
2988: FC 7C 1F FE 7C 1F FE FC B7
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 113 and 116 explain these codes and provide other essential information on entering *Ahoy!* programs. Refer to these pages **before** entering any programs!

```
2990: 3E 1F F0 3C 0F E0 38 07 4A
2998: E0 38 07 E0 38 07 E0 38 F1
29A0: 07 E0 38 07 E0 38 07 F0 D8
29A8: 1C 0F F8 1E 1F 7F FF FE 88
29B0: 7F FF FE 3F FF FC 0F FF 7A
29B8: F0 00 00 00 00 00 00 00 A9
29C0: 00 00 00 00 00 00 00 18 D8
29C8: 00 00 18 00 18 18 18 1E 47
29D0: 18 78 07 99 E0 01 FF 80 64
29D8: 00 FE 00 00 3C 00 00 3C 50
29E0: 00 00 FE 00 01 FF 80 07 68
29E8: 99 E0 1E 18 78 18 18 18 5A
29F0: 00 18 00 00 18 00 00 00 21
29F8: 00 00 00 00 00 00 00 00 F8
```

INFRARAID

FROM PAGE 110

FROM PAGE 110

```
·0 REM ******************************         CE
·1 REM *                            *         OO
·2 REM *      -- INFRARAID --       *         CO
·3 REM * ERROR TRAPPING FOR THE C-64 *        MA
·4 REM *                            *         OO
·5 REM * AUTHOR: TIMOTHY VANDEVENTER *        DN
·6 REM *         3851 E. EATON HWY. *         JG
·7 REM *         SUNFIELD, MI  48890 *        OL
·8 REM *                            *         OO
·9 REM ******************************         CE
·10 POKE53281,0:POKE53280,0:PRINT"[CLEAR]
 [GREEN]"                                     DN
·15 FORI=50176TO50670                         BF
·20 READA:CS=CS+A:LN=100+INT((I-50176)/7)
 *10                                          NC
·30 IFA>255ORA<0THENPRINT:PRINT"[RED]BAD
 DATA IN LINE"LN:STOP                         NM
·40 POKEI,A:PRINTLN;:X=X+1:IFX=7THENX=0:P
 RINT                                         PC
·50 NEXT                                      IA
·60 IFCS<>65731THENPRINT:PRINT"[RED]CHECK
 SUM ERROR. CHECK ALL DATA.":STOP             DP
·70 PRINT:PRINT"[CLEAR][4"[DOWN]"][GREEN]
 INFRARAID LOADED!"                           BL
·80 PRINT"[DOWN][DOWN]DO YOU WISH TO SAVE
  TO [RED]D[GREEN]ISK OR [RED]T[GREEN]APE
 ?"                                           GI
·82 GETC$:IFC$<>"T"ANDC$<>"D"THEN82           GI
·84 IFC$="T"THEN92                            FM
·86 POKE43,0:POKE44,196:POKE45,239:POKE46
 ,197                                         LH
·88 SAVE"INFRARAID(50176)",8,1                MM
·90 GOTO98                                    AH
·92 POKE43,0:POKE44,196:POKE45,239:POKE46
 ,197                                         LH
·94 SAVE"INFRARAID(50176)",1,1                MB
·98 POKE43,1:POKE44,8:POKE45,1:POKE46,8       HB
·99 PRINT"[DOWN]TO ACTIVATE, ENTER [RED]S
 YS 50176":END                                FB
·100 DATA 173,0,3,205,235,197,240             CO
·110 DATA 3,141,225,197,173,1,3               NB
·120 DATA 205,236,197,240,15,141,226          JB
·130 DATA 197,173,235,197,141,0,3             CO
·140 DATA 173,236,197,141,1,3,32              II
·150 DATA 99,197,76,125,197,142,237           LJ
·160 DATA 197,32,189,197,32,99,197            MI
·170 DATA 224,128,240,6,165,58,201            NM
·180 DATA 255,208,3,76,17,197,32              CO
·190 DATA 125,197,240,74,224,15,208           PH
·200 DATA 12,41,1,240,66,173,238              MH
·210 DATA 197,208,45,104,104,96,224           LC
·220 DATA 20,208,10,41,2,240,50               JO
·230 DATA 173,238,197,208,29,96,224           KM
·240 DATA 4,208,10,41,4,240,36                PM
·250 DATA 173,238,197,208,15,96,224           MJ
·260 DATA 5,208,26,41,8,240,22                HL
·270 DATA 173,238,197,208,1,96,173            FD
·280 DATA 227,197,133,20,173,228,197          IL
·290 DATA 133,21,32,163,168,76,174            CA
·300 DATA 167,169,32,162,255,232,157          DO
·310 DATA 0,4,157,250,4,157,244               FO
·320 DATA 5,157,238,6,224,250,208             MC
·330 DATA 239,162,255,232,181,217,9           LM
·340 DATA 128,149,217,224,25,208,245          ND
·350 DATA 169,14,141,32,208,169,6             NG
·360 DATA 141,33,208,169,14,141,134           JG
·370 DATA 2,24,162,1,134,214,160              MG
·380 DATA 0,132,211,32,240,255,169            IO
·390 DATA 0,133,19,133,184,165,57             KL
·400 DATA 133,20,165,58,133,21,32             GH
·410 DATA 19,166,144,44,160,2,132             LL
·420 DATA 15,177,95,170,200,177,95            KN
·430 DATA 132,73,32,205,189,169,32            GO
·440 DATA 164,73,41,127,32,210,255            LN
·450 DATA 201,34,208,6,165,15,73              BC
·460 DATA 255,133,15,200,240,7,32             HN
·470 DATA 60,197,177,95,208,11,174            CP
·480 DATA 237,197,169,14,141,134,2            BH
·490 DATA 108,225,197,16,220,201,255          DF
·500 DATA 240,216,36,15,48,212,56             FI
·510 DATA 233,127,170,132,73,160,255          JL
·520 DATA 202,240,8,200,185,158,160           MA
·530 DATA 16,250,48,245,200,185,158           KG
·540 DATA 160,48,183,32,210,255,208           JC
·550 DATA 245,132,73,169,14,141,134           GJ
·560 DATA 2,152,24,101,95,197,122             PC
·570 DATA 240,16,200,24,105,1,197             KN
·580 DATA 122,208,13,177,95,240,4             CA
·590 DATA 201,58,208,5,169,1,141              HE
·600 DATA 134,2,164,73,96,173,229             CG
·610 DATA 197,133,69,173,230,197,133          LJ
·620 DATA 70,32,231,176,160,0,152             MH
```

```
·630 DATA 145,71,174,237,197,200,138    KN
·640 DATA 145,71,96,173,231,197,133     HP
·650 DATA 69,173,232,197,133,70,32      KK
·660 DATA 231,176,169,237,141,40,3      GG
·670 DATA 169,246,141,41,3,169,237      KJ
·680 DATA 141,40,3,160,0,177,71         IM
·690 DATA 41,32,240,5,169,239,141       KB
·700 DATA 40,3,177,71,41,64,240         HA
·710 DATA 10,169,188,141,41,3,169       OI
·720 DATA 54,141,40,3,200,177,71        MF
·730 DATA 174,237,197,96,173,233,197    PG
·740 DATA 133,69,173,234,197,133,70     JM
·750 DATA 32,231,176,160,0,177,71       AP
·760 DATA 141,228,197,141.238.197,200   PL
·770 DATA 177,71,141,227,197,13,238     GP
·780 DATA 197,141,238,197,96,139,227    EG
·790 DATA 0,0,197,210,212,210,197       JL
·800 DATA 204,40,196,128,0              ME
```

MICROSIM
FROM PAGE 89

```
·10 REM MICRO FLIGHT SIMULATOR                OF
·15 REM BY TIM GERCHMEZ                       GN
·20 IFPEEK(49152)=169ANDPEEK(49158)=69THE
N30                                           PC
·25 FORT=49152TO49152+36:READA:POKET,A:NE
XT                                            NJ
·30 POKE53265,27:POKE56333,127:POKE788,0:
POKE789,192:POKE53274,129                     BK
·35 POKE53281,0:POKE646,1:POKE650,128:POK
E49169,2:POKE49167,255:POKE49160,11           CK
·40 PRINTCHR$(147)CHR$(9)CHR$(15)CHR$(8)"
[DOWN][DOWN]";:R1$="[10"[RIGHT]"]":LF$="
[7"[LEFT]"]"                                  OM
·45 L6$="[6"[LEFT]"]":DN$="[HOME][11"[DOW
N]"]"                                         NF
·46 DIMJ(127):J(109)=45:J(126)=85:J(125)=
68:J(123)=44:J(119)=46:J(110)=43              HH
·47 JY=56320:KB=631:KJ=198                    JB
·50 PRINT"[RED][7"[s *]"][c E][22"[s *]"]
[c E][9"[s *]"][UP][UP][7"[RIGHT]"]";         FP
·55 PRINT"[s B][WHITE]MICRO FLIGHT SIMULA
TOR[RED][s B][HOME][7"[RIGHT]"][s U][22"
[s C]"][s I][HOME]"                           CK
·60 PRINT"[DOWN][DOWN][CYAN][s U][6"[s C]
"][s I]":PRINT"[s B][6" "][s B]":PRINT"[
s J][6"[s C]"][s K]":PRINT"[RIGHT][RIGHT
][YELLOW]TIME[CYAN]"                          GK
·65 PRINT"[s U][7"[s C]"][s I]":PRINT"[s
B][7" "][s B]":PRINT"[s J][7"[s C]"][s K
]":PRINT"[RIGHT][RIGHT][YELLOW]ERPM[CYAN
]"                                            IP
·70 PRINT"[s U][8"[s C]"][s I]":PRINT"[s
B][8" "][s B]":PRINT"[s J][8"[s C]"][s K
]":PRINT"[RIGHT][YELLOW]AIRSPEED"             NF
·75 PRINT"[3"[RIGHT]"]KTS[CYAN]":PRINT"[s
U][11"[s C]"][s I]":PRINT"[s B][11" "][
s B]":PRINT"[s J][11"[s C]"][s K]"            PF
·80 PRINT"[RIGHT][YELLOW]GROUNDSPEED":PRI
NT"[5"[RIGHT]"]MPH"                           JK
·85 PRINT"[HOME][3"[DOWN]"][CYAN]"R1$"[s
U][9"[s C]"][s I]":PRINTR1$"[s B][9" "][
s B]":PRINTR1$"[s J][9"[s C]"][s K]"          KA
·90 PRINTR1$"[RIGHT][c 1]ALTIMETER[CYAN]"     FL
·95 PRINTR1$"[s U][6"[s C]"][s I]":PRINTR
1$"[s B][6" "][s B]":PRINTR1$"[s J][6"[s
C]"][s K]"                                    JO
·100 PRINTR1$"[RIGHT][c 3]RUDDER[CYAN][3"
[UP]"][RIGHT][RIGHT][s U][5"[s C]"][s I]
[DOWN]"LF$"[s B][5" "][s B][DOWN]"LF$"[s
J][5"[s C]"][s K][DOWN]"L6$"ELEV."            KB
·105 PRINTR1$"[s U][7"[s C]"][s I]":PRINT
R1$"[s B][7" "][s B]"                         MF
·110 PRINTR1$"[s J][7"[s C]"][s K]":PRINT
R1$"[RIGHT][WHITE]HEADING[CYAN]"              JA
·115 R2$="[11"[RIGHT]"]"                      OA
·120 R1$="[19"[RIGHT]"]":PRINTR1$"[DOWN][
s U][4"[s C]"][s I][WHITE][UP][UP][5"[LE
FT]"]BI>[CYAN][DOWN][DOWN]":PRINTR1$"[s
B]FUEL[s B]"                                  HG
·125 PRINTR1$"[s B][4"[s C]"][s B]":PRINT
R1$"[s B][GREEN]F[CYAN][3" "][s B]":PRIN
TR1$"[s B][4" "][s B]":PRINTR1$"[s B][4"
"][s B]"                                      IJ
·130 PRINTR1$"[s B][RED]E[CYAN][3" "][s B
]":PRINTR1$"[s J][4"[s C]"][s K]"             AG
·135 PRINT"[UP][UP][4"[RIGHT]"][WHITE][s
Q]":PRINT"[RIGHT][RIGHT][c 8]STALL[3"[RI
GHT]"][WHITE]OIL TEMP[UP]"LF$"[LEFT][LEF
T][CYAN][s J][8"[s C]"][s K]";                HA
·140 PRINT"[UP]"LF$"[3"[LEFT]"][s B][WHIT
E]C[6" "]H[CYAN][s B][UP]"LF$"[3"[LEFT]"
][s U][8"[s C]"][s I]";                       DB
·145 PRINT"[UP][UP][5"[LEFT]"][s J][s C][
s K][DOWN][LEFT][LEFT]P[UP][UP][LEFT][LE
FT][s B][RVSON][WHITE] [RVSOFF][CYAN][s
B][UP][3"[LEFT]"][s U][s C][s I]"             BF
·150 PRINTDN$"[DOWN]"R1$"[RIGHT][YELLOW]F
LAPS"                                         MD
·155 PRINT"[CYAN][HOME][3"[DOWN]"]"R1$"[R
IGHT][RIGHT][s U][3"[s C]"][s I][DOWN]"L
6$"[RIGHT][s B][RVSON][WHITE][3" "][CYAN
][RVSOFF][s B][DOWN]"L6$"[RIGHT][s J][3"
[s C]"][s K]";                                DE
·160 PRINT"[DOWN]"L6$"[RIGHT][RIGHT]CWI"      BA
·165 GOSUB255                                 CK
·170 POKE198,0                                KB
·175 GETA$:IFA$<>""THEN180                    CP
·176 POKEKJ,1:POKEKB,J(PEEK(JY)):GETA$:IF
A$=""THENGOSUB450:GOTO245                     DO
·180 IFA$="O"THENIFGD=1ANDGS=0THEN935         HK
·185 IFA$="X"THENGOSUB605  :GOTO245           GD
·190 IFA$="H"THENGOSUB635  :GOTO245           IO
·195 IFA$="+"ORA$="-"THENGOSUB680  :GOTO2
```

```
45                                                OG
·200 IFA$="R"THENFP=1:GOTO245                     MI
·205 IFA$="L"THENFP=0:GOTO245                     OP
·210 IFA$="<"ORA$=","THENRU=RU+(RU>-45):P
RINTRU$;RU;S$                                     JO
·215 IFA$=">"ORA$="."THENRU=RU-(RU<45):PR
INTRU$;RU;S$                                      FI
·220 IFA$="U"THENEL=EL-(EL<45):PRINTEL$;E
L;S$:GOTO245                                      NN
·225 IFA$="D"THENEL=EL+(EL>-45):PRINTEL$;
EL;S$:GOTO245                                     LE
·226 IFA$>"0"ANDA$<"8"THENGOSUB1200               DE
·228 IFA$="0"THENGOSUB251                         NP
·230 IFRU=0THENPRINTP8$                           PK
·235 IFRU<0THENPRINTP7$                           CC
·240 IFRU>0THENPRINTP9$                           PK
·245 IFDOTHENRETURN                               FN
·250 GOTO175                                      CL
·251 FY=FY+6:IFFY>6THENFY=0                       FB
·252 IFFY=0 THEN PRINTDN$RX$"[WHITE]NIGHT
":POKE49160,0:GOTO254                             JG
·253 PRINTDN$RX$"[WHITE]DAY  ":POKE49160,
11                                                AM
·254 PRINTRX$"FLYING":RETURN                      FC
·255 REM DEFINE VARIABLES + SET UP                MD
·260 MJ$="[8"[DOWN]"]":TM$="[HOME][4"[DOW
N]"][RIGHT]":ER$="[HOME]"+MJ$+"[RIGHT]":
AS$=DN$+"[DOWN][RIGHT]"                           DL
·265 GS$=DN$+"[6"[DOWN]"][RIGHT]":AT$="[H
OME][4"[DOWN]"]"+R2$                              OB
·270 CL$="[HOME][4"[DOWN]"]"+R1$+"[3"[RIG
HT]"]"                                            JG
·275 EL$="[HOME][8"[DOWN]"]"+R1$+"[RIGHT]
"                                                 HJ
·280 FP$=DN$+"[DOWN][DOWN]"+R1$+"[RIGHT]"
:FP=1                                             EG
·285 P7$=FP$+"[RED][4"[RIGHT]"][DOWN][3"
"][LEFT][UP][s N][DOWN][LEFT][LEFT][s Q]
[DOWN][LEFT][LEFT][s N]":P8$=FP$+"[4"[RI
GHT]"][3" "][DOWN][DOWN][3"[LEFT]"][3" "
][UP][3"[LEFT]"][GREEN][s C][s Q][s C]"           NA
·290 P9$=FP$+"[RED][4"[RIGHT]"][DOWN][3"
"][UP][3"[LEFT]"][s M][DOWN][s Q][DOWN][
s M]"                                             MN
·295 IFQ0>120ORAS>120THENAS=120:Q0=120            CL
·300 RU$="[HOME]"+MJ$+R2$:HE$=DN$+"[DOWN]
"+R2$:S$="[LEFT]  "                               KC
·305 PR$=DN$+"[6"[DOWN]"]"+R2$+"[4"[RIGHT
]"]"                                              GP
·306 A$="[6"[DOWN]"]":B$="[25"[RIGHT]"]":
I1$=DN$+A$+B$:I2$=DN$+"[DOWN][DOWN]"+A$+
B$                                                MB
·307 I3$=DN$+"[4"[DOWN]"]"+A$+B$:I4$=DN$+
"[6"[DOWN]"]"+A$+B$                               IG
·308 IN$="[s Z]":PRINTI1$"[RED]"IN$"[WHIT
E]1"I2$"[RED]"IN$"[WHITE]2"I3$IN$"3"I4$"
[GREEN]"IN$"[WHITE]4[RED]"                        AI
·310 DIMFL$(2):FL$(1)=DN$+MJ$+"[3"[DOWN]"
]"+R1$+"[4"[RIGHT]"]":FL$(2)=FL$(1)               FO
·315 OT$=DN$+MJ$+"[DOWN][DOWN]"+R2$+"[5"[
RIGHT]"]"                                         ML
·320 ER=800:AS=90:GS=AS:AT=GS:RU=AT:HE=RU
:EL=HE:F1=235:F2=2:F3=0:F4=6:W=2                  EB
·325 SW=56180:SI=F3:GD=1:Q0=0:DG=Q0:DO=0:
ML=0:I1=1:I2=1:I3=0:I4=1:BO=49169                 DN
·327 I5=0:I6=0:I7=0:KX=0:FY=6                     CC
·330 S=54272:FORT=STOS+24:POKET,0:NEXT:PO
KES+6,240:POKES,F1:POKES+1,F2                     EG
·335 POKES+4,33:POKES+24,15:POKES+13,240:
POKES+7,F3:POKES+8,F4:POKES+11,17                 GP
·340 PRINT"[WHITE]"TM$;TI$:PRINTP8$"[WHIT
E]"                                               MA
·345 FORX=90TO1STEP-W:POKESW,2                    HK
·350 PRINTER$;ER;S$;AS$;AS;S$;GS$;GS;S$;A
T$;AT;S$;RU$;RU;S$;HE$;HE;S$;FL$(1)"[BAC
KARROW]"                                          OA
·355 PRINTEL$;EL;S$:EL=EL-W                       AI
·360 PRINTOT$"[RED][UPARROW][WHITE]";:IFX
/18=INT(X/18)THENPRINTOT$" ";:OT$=LEFT$(
OT$,LEN(OT$)-1)                                   PO
·365 ER=ER-W:AS=AS-W:GS=GS-W:AT=AT-W:RU=R
U-W:HE=HE+W:F1=F1-.5:POKES,F1:POKESW,1            OD
·370 F2=F2-.021:POKES+1,F2                        JL
·372 IFX=30ORX=60ORX=90THENPRINTFL$(1)" "
:FL$(1)=FL$(1)+"[UP]":FL$(2)=FL$(2)+"[UP
]"                                                FE
·375 NEXT:TI$="[6"0"]":PRINTTM$;TI$;FP$;"
[YELLOW]UP  "                                     OH
·380 POKES+15,75:POKES+20,240:POKES+18,17
:FORT=1TO300:NEXT                                 AE
·385 POKES+15,50:FORX=1TO300:NEXT:POKES+1
8,16                                              HH
·390 RX$=R1$+"[8"[RIGHT]"]"                       AL
·392 PRINTDN$RX$"[WHITE][LEFT][UP][UP][c
D]":PRINTDN$RX$"[LEFT][UP][c D]":PRINTDN
$RX$"[LEFT][c D]"                                 HA
·395 PRINT"[HOME][RED][DOWN][DOWN]"RX$"[c
R]";:FORT=1TO22:PRINT"[DOWN][LEFT][s B]
";:NEXT                                           PJ
·400 RX$=RX$+"[RIGHT]":PRINT"[HOME][3"[DO
WN]"][WHITE]"RX$;"+ - ENGINE":PRINTRX$"<
> RUDDER"                                         AP
·405 PRINTRX$"U D ELEVATOR":PRINTRX$"[UP]
R L FLAPS":PRINTRX$"H HEAR ATIS"                  BM
·410 PRINTRX$"X REFUEL":PRINTRX$"O DEMO"          GE
·415 PRINTRX$"[RED][LEFT][c Q][11"[s C]"]
";:POKE1463,67:POKE1463+S,2                       KN
·420 PRINTRX$"[RED][RIGHT]CABIN":PRINTRX$
"PRESSURE":PRINTRX$"ON[WHITE]":PRINTPR$"
[RVSON][RED] [RVSOFF][WHITE]"                     BF
·425 POKES+15,255:POKES+18,16:POKES+18,12
9                                                 AI
·430 PRINTTM$;TI$:IFTI$<>"[4"0"]16"THEN43
0  "                                              GG
·435 PRINTDN$;RX$;"[5" "]"                        MC
·440 PRINTRX$"[8" "]":PRINTRX$"  ":POKES+
```

```
18,128: POKES+15,90:POKES+18,17                KN
·445 PRINTPR$"[RVSON][WHITE] [RVSOFF]"          FO
·446 T=INT(8000*RND(1))+1000:U=INT(300*RN
D(1))+200:Y1=T+U:Y2=T-U:GOSUB875               OH
·448 RETURN                                     IM
·450 PRINT"[WHITE]"EL$;EL;S$;TM$;TI$;ER$;
ER;S$;AS$;AS;S$;GS$;GS;S$;AT$;AT;S$            EM
·465 PRINTRU$;RU;S$;HE$;HE;S$;:PC=RND(1)       IH
·470 IFAT>31000THENPOKES+4,32:GOSUB895:GO
SUB845:GOTO820                                  DA
·475 IFAS>100THENIFEL>30THENGOSUB900:GOSU
B845:GOTO820                                    CC
·480 IFPC>.997THENIFLEN(OT$)<38THENPRINTO
T$" ":OT$=OT$+"[RIGHT]":PRINTOT$"[RED][U
PARROW][WHITE]"                                 GA
·485 IFF2<1THENGS=0                             AO
·487 KX=KX+1:KX=KX-.2*(I5=1)-.5*(I6=1)-.5
*(I7=1)                                         EM
·490 IFPC>.98ANDDG=0ANDAT>5000THENPRINTCL
$"[RED][RVSON][3" "][RVSOFF][WHITE]":DG=
1:D3=HE:D8=0:GOSUB890                           PC
·495 IFDG=1THEND8=D8+1:GOSUB910                 KI
·500 IFGS>1ORAS>1THENIFPC>.88THENGS=GS-1:
Q0=Q0-2:F1=F1-10:ER=ER+20*(ER>0)                GJ
·505 IFF1<0THENF1=255:F2=F2-1:IFF2<0THENF
2=0                                             KN
·510 POKES,F1:POKES+1,F2                        CE
·515 IFSITHENPOKESW,2:POKES+18,17:POKES+1
5,50:AT=AT+D9*(AT>0):D9=D9+24:GOTO525           AM
·520 POKESW,1:POKES+18,16:D9=15:GOTO530         KK
·525 POKES+1,D9 AND3                            HJ
·530 IFGD=0THENGOSUB745:IFGD=0THENSI=-(AS
<10):IFAS<30THENIFEL>20THENSI=1                 BF
·535 IFGD=0ANDER<300THENPOKES+4,32:GOSUB8
95 :GOSUB845:GOTO820                            FM
·540 IFAT<=0ANDGD=0THEN820                      OF
·545 IFAS<Q0THENAS=Q0                           LA
·550 IFEL>40ANDGD=0THENSI=1                     IE
·555 IFFPTHENPRINTFP$"[YELLOW]UP  ":GOTO5
65                                              AH
·560 PRINTFP$"[YELLOW]DOWN":                    JO
·565 IFGD=0THENGS=0:IFAT<=10THENAT=10           KH
·570 IFEL<=40ANDAS>=10THENSI=0                  GI
·575 IFGD=1THENIFFP=0THENIFEL>20THENIFGS>
60THENGD=0:AT=30:AS=GS:GS=0:GOSUB602            BA
·580 IFAT<=0THENAT=0                            MK
·585 IFKX>300THENKX=0:GOSUB800                  AF
·590 IFGD=0THENAS=AS-1:IFPC>.7THENAS=AS+1
:IFPC>.8THENAS=AS+1                             NL
·595 IFGD=0THENIFAS>120THENAS=120               HP
·600 RETURN                                     IM
·602 Q0=AS:TI$="[6"0"]":POKEBO,FY:CO=0:MX
=0:RETURN                                       GO
·605 IFGD<>1THEN625                             PH
·610 PRINTFL$(I4)" ";                           JL
·615 IFLEN(FL$(1))<49THENFL$(1)=FL$(1)+"[
UP]":GOTO615                                    DN
·620 FL$(2)=FL$(1):PRINTFL$(I4)"[WHITE][B
ACKARROW]";:RETURN                              AK
·625 PRINTDN$"[13"[DOWN]"]"R2$"[5"[RIGHT]
"][WHITE]GROUND ONLY":                          CP
·630 FORX=1TO1000:NEXT:PRINT"[11"[LEFT]"]
[11" "]";:RETURN                                AK
·635 PRINTDN$RX$"[YELLOW]TERMINAL":PRINTR
X$"INFORMATION":PRINTRX$"SERVICE"               JM
·640 T1=65:FORX=1TO10:T1=T1+(RND(1)>.5):N
EXT:PRINTRX$"[WHITE][DOWN]TEMP:"T1              BA
·645 PRINTRX$"ALT:29.95":T1=INT(15*RND(1)
)+10:PRINTRX$"VIS:"T1                           ME
·646 PRINTRX$"TNMT:"ML                          LN
·650 IFRND(1)>.5THENA$="ALPHA[3"."]":GOTO
665                                             NF
·655 IFRND(1)>.5THENA$="BRAVO[3"."]":GOTO
665                                             OA
·660 A$="CHARLEY[3"."]"                         OC
·665 PRINTRX$"[YELLOW][DOWN]THIS":PRINTRX
$"IS":PRINTRX$;A$:Z0=PEEK(161)+2               OC
·670 PRINT"[WHITE]"TM$;TI$;:ON-(PEEK(161)
<>Z0)GOTO670:PRINTDN$;                          KJ
·675 FORX=1TO12:PRINTRX$"[11" "]":NEXT:IF
DOTHENGOSUB1030                                 MI
·677 RETURN                                     IM
·680 IFA$="-"THEN715                            JB
·685 IFF2>=5THENRETURN                          NN
·690 F1=F1+10:IFF1>255THENF1=0:F2=F2+1          DB
·695 IFGDTHENGS=GS+1:Q0=0:GOTO710               HC
·700 Q0=Q0+3:IFQ0>120THENQ0=120                 OI
·705 IFQ0>=ASTHENAS=Q0                          HB
·710 ER=ER+20:GOTO740                           HM
·715 IFF2<=.25THEN740                           CM
·720 IFF2=.25 ANDF1<=235THEN740                 MF
·725 IFGD=1THENGS=GS-1:AS=0:Q0=0:IFGS<0TH
ENGS=0                                          AE
·730 IFGD=0THENQ0=Q0-3:IFQ0<0THENQ0=0           PF
·735 F1=F1-10:ER=ER-20:IFF1<0THENF1=255:F
2=F2-1                                          OO
·740 POKES,F1:POKES+1,F2:PRINT"[RED]"AS$;
AS;S$;GS$;GS;S$;ER$;ER;S$:RETURN                GF
·745 IF((EL>-4ANDEL<5)AND(AS<80))THENIF(A
T<20ANDFP=1)AND(I1=1)THEN790                    EH
·747 Z7=AT                                      NI
·750 AT=AT+(SGN(EL)*(.1*AS)+2.5*EL)+2*PC:
IFAT>32000THENAT=32000                          BE
·760 AT=AT-2*(FP=0):AT=AT+2*(RU<-30 OR RU
>30):IFEL=-1THENAT=Z7:AT=AT-INT(2*PC)           DJ
·762 IFAS<40ANDEL>30THENGOSUB845:GOTO820        OK
·763 IF(RU>40ORRU<-40)ANDAS>50THENGOSUB86
6:GOSUB845:GOTO820                              GK
·765 IFEL=0THENAT=Z7:T=INT(PC*5):AT=AT+(T
*(AS<40)):AT=AT-(T*(AS>95))                     LI
·766 IFAT<Y1ANDAT>Y2THENPOKEBO,1:GOTO770        IF
·767 POKEBO,FY                                  PL
·770 HE=HE+((AS/100)*RU):HE=INT(HE):IFHE<
0THENHE=359                                     ED
·775 IFHE>359THENHE=0                           IB
·780 IFAS<30ANDEL=0THENZZ=30-AS:AT=AT-ZZ        FN
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 113 and 116 explain these codes and provide other essential information on entering *Ahoy!* programs. Refer to these pages **before** entering any programs!

```
·785 CO=CO+1:MX=AS*(TI/60/60/60):MT=MT+MX
/CO:ML=INT(MT):AT=INT(AT):RETURN           GM
·790 GD=1:GS=AS:AS=0:Q0=0:IFABS(RU)>15THE
N820                                       JE
·795 POKEBO,2:AT=0:GOSUB875:RETURN         HM
·800 PRINTFL$(I4)" ";:IFGD=0THENFL$(I4)=L
EFT$(FL$(I4),LEN(FL$(I4))-1)               DI
·810 IFLEN(FL$(I4))<46THENGOSUB845:GOTO82
0                                          JB
·815 M2=M1:PRINTFL$(I4)"[WHITE][BACKARROW
]":RETURN                                  ME
·820 PRINT"[HOME][18"[DOWN]"]"RX$"[WHITE]
CRASH!!":POKE54290,16:POKE54276,32         BH
·825 IFLEN(FL$(I4))<46THENPRINTRX$"[DOWN]
[DOWN]FUEL GONE!"                          CD
·830 POKE54287,5                           PP
·835 POKE54290,129                         ID
·840 FORX=1TO5000:NEXT:RUN                 NH
·845 AS=300:AT=INT(AT):FORX=5TO0STEP-1:PO
KES+1,X:FORY=255TO0STEP-5:POKES,Y          MD
·850 IFAT<=0THENRETURN                     OL
·855 AT=AT-100:PRINTTM$;TI$;AT$;AT;S$;AS$
;AS;S$                                     EO
·860 NEXT:IFX=3THENGOSUB870                HK
·865 NEXT:RETURN                           EJ
·866 POKES+1,F2+1:FORT=1TO600:NEXT:POKES+
1,F2+2:FORT=1TO600:NEXT:POKES+1,F2+3       MA
·867 FORT=1TO600:NEXT:RETURN               JL
·870 POKES+18,129:POKES+15,200:RETURN      KN
·875 GOSUB880:FORX=1TO500:NEXT:GOTO880     JE
·880 FORX=20TO1STEP-1:POKES+1,X:NEXT:POKE
S+4,32:POKES+4,129:FORX=1TO500:NEXT        JL
·885 POKES+4,128:POKES+4,33:RETURN         MF
·890 L4=INT(50*RND(1))+16:V=INT(10*RND(1)
)+1:V1=D3+V:V2=D3-V:RETURN                 JE
·895 FORT=1TO2000:NEXT                     OB
·900 PRINT"[HOME][11"[DOWN]"][RED]"RX$"EN
GINE":PRINTRX$"FAILURE":POKES+18,33        NA
·905 FORX=1TO2000:NEXT:POKES+4,33:RETURN   CG
·910 IFHE>V1ORHE<V2THENDG=0:PRINTCL$"[RVS
ON][WHITE][3" "][RVSOFF]":RETURN           GP
·915 IFD8<120-ASTHENRETURN                 LE
·920 PRINTDN$"[5"[DOWN]"]"RX$"COLLISION!"
:GOSUB845:GOTO820                          NA
·925 DATA169,1,141,25,208,162,69,160,11,1
73,18,208,48,4,162,255,160,2,142,18        NH
·930 DATA208,140,32,208,173,13,220,41,1,2
40,3,76,49,234,76,188,254                  CF
·935 GOSUB1030:DO=1                        CB
·940 POKEKJ,1:POKEKB,ASC("+"):GOSUB175:IF
GS<65THEN940                               LP
·950 POKEKJ,1:POKEKB,ASC("U"):GOSUB175:IF
EL<29THEN950                               GP
·955 POKEKJ,1:POKEKB,ASC("L"):GOSUB175:GO
SUB450:GOSUB450:GOSUB450                   HJ
·960 POKEKJ,1:POKEKB,ASC("1"):GOSUB175     FB
·965 POKEKJ,1:POKEKB,ASC("D"):GOSUB175:IF
EL>4THEN965                                AF
·970 D5=0:PX=0                             CB
·975 GOSUB175                              CP
·980 IFAS<60THENPOKEKJ,1:POKEKB,ASC("+"):
GOSUB175:GOTO980                           KO
·985 IFDG=1THENRN=INT(10*RND(1)):RU=RU+RN
:GOSUB450:RU=RU-RN                         MJ
·990 IFD5=100THENPX=1:POKEKJ,1:POKEKB,ASC
("D"):GOSUB175:IFEL<>-6THEN990             PF
·995 IFEL>6 THEN EL=EL-1:GOSUB450:GOTO995  IA
·1000 D5=D5+1:IFPX=0THEN975                CE
·1002 GOSUB175:IFAS<40THENPOKEKJ,1:POKEKB
,ASC("+"):GOSUB175:GOTO1002                MD
·1003 IFAT>200THEN1002                     NO
·1005 POKEKJ,1:POKEKB,ASC("U"):GOSUB175:I
FEL<-2THEN1005                             AC
·1007 POKEKJ,1: POKEKB,ASC("1"):GOSUB175   KE
·1010 POKEKJ,1:POKEKB,ASC("R")             LN
·1015 GOSUB175:IFGD<>1THEN1015             HO
·1020 GOSUB175:POKEKJ,1:POKEKB,ASC("-"):I
FGS>0THEN1020                              OM
·1025 RU=0:GOSUB1035:PRINTRX$"[UP][UP][4"
" "]":DO=0:EL=0:GOTO175                    AO
·1030 PRINTDN$"[4"[DOWN]"]"RX$"DEMO":PRIN
TRX$"FLIGHT":RETURN                        JD
·1035 PRINTDN$"[5"[DOWN]"]"RX$"[6" "]":RE
TURN                                       NN
·1200 IFA$>"4"THEN1400                     JC
·1202 IFA$="1"THENI1=1-I1:GOSUB1300:GOSUB
1220:RETURN                                DP
·1205 IFA$="2"THENI2=1-I2:GOSUB1230:RETUR
N                                          NB
·1210 IFA$="3"THENI3=1-I3:GOSUB1240:RETUR
N                                          NH
·1217 IFA$="4"THENGOSUB1350:GOSUB1260:RET
URN                                        HH
·1220 IFI1=1THENPRINTI1$"[RED][s Z][WHITE
]":RETURN                                  MD
·1225 PRINTI1$"[WHITE][s Z]":IFGD=1THEN82
0                                          PB
·1227 RETURN                               IM
·1230 IFI2=1THENPRINTI2$"[RED][s Z][WHITE
]":RETURN                                  CL
·1235 PRINTI2$"[WHITE][s Z]":RETURN        CM
·1240 IFI3=1THENPRINTI3$"[RED][s Z][WHITE
]":GOSUB1310:RETURN                        PG
·1250 PRINTI3$"[WHITE][s Z]":GOSUB1330:RE
TURN                                       LM
·1260 IFI4=1THENPRINTI4$"[GREEN][s Z]":RE
TURN                                       OM
·1270 PRINTI4$"[RED][s Z]":RETURN          DH
·1300 POKES+11,33:POKES+8,4:FORU=1TO2000:
NEXT:POKES+11,32                           EH
·1305 POKES+7,F3:POKES+8,F4:POKES+11,17:R
ETURN                                      NG
```

```
·1310 F1=F1-40:ER=ER+80*(ER>0):IFF1<0THEN
 F1=255:F2=F2-1:IFF2<0THENF2=0          CB
·1320 POKES,F1:POKES+1,F2:RETURN        OF
·1330 F1=F1+40:ER=ER+80:IFF1>255THENF1=0:
 F2=F2+1                                LK
·1335 GOTO1320                          FL
·1350 PRINTFL$(I4)" ":I4=I4+1:IFI4=3THENI
 4=1                                    AG
·1355 PRINTFL$(I4)"[WHITE][BACKARROW]":RE
 TURN                                   KI
·1400 IFA$="5"THENI5=1-I5               HB
·1402 IFA$="6"THENI6=1-I6               GO
·1404 IFA$="7"THENI7=1-I7               ED
·1406 IF I5=1 THEN PRINTDN$RX$"[UP][UP][L
 EFT][LEFT][RED][c D]":GOTO1410         EN
·1408 PRINTDN$RX$"[LEFT][LEFT][WHITE][UP]
 [UP][c D]"                             GK
·1410 IFI6=1THENPRINTDN$RX$"[LEFT][LEFT][
 UP][RED][c D]":GOTO1414                BO
·1412 PRINTDN$RX$"[LEFT][LEFT][UP][WHITE]
 [c D]"                                 OA
·1414 IFI7=1THEN PRINTDN$RX$"[LEFT][LEFT]
 [RED][c D][WHITE]":RETURN              PD
·1416 PRINTDN$RX$"[WHITE][LEFT][LEFT][c D
 ]":RETURN                              OO
```

MEMORY CHECK

FROM PAGE 46

```
·10 REM *** COMMODORE 64 MEMORY CHECK *** NP
·20 PRINT"[CLEAR]LOADING AND VERIFYING DA
 TA[3"."]"                              DB
·30 FORJ=49152TO49268:READA:POKEJ,A:X=X+A
 :NEXTJ                                 FP
·40 IFX<>14524THENPRINT"[DOWN]ERROR IN DA
 TA[3"."]":END                          IN
·50 PRINT"[DOWN]DATA IS OK[3"."]"       AH
·60 PRINT"[DOWN]SYS49152 TO BEGIN MEMORY
 CHECK[3"."]":NEW                       IJ
·70 DATA32,68,229,169,0,168,153,40,216,20
 0,192,120                              EM
·80 DATA144,248,133,251,162,8,134,252,170
 ,168,169,48                            AE
·90 DATA141,57,4,141,59,4,169,50,141,58,4
 ,169                                   AL
·100 DATA52,141,60,4,169,56,141,61,4,140,
 139,4                                  BC
·110 DATA152,129,251,193,251,208,50,200,1
 92,0,208,241                           EG
·120 DATA230,251,165,251,208,8,165,252,20
 1,159,176,39                           EN
·130 DATA230,252,160,22,185,39,4,201,57,1
 76,13,170                              LJ
·140 DATA232,138,153,39,4,162,0,160,0,76,
 45,192                                 JO
·150 DATA169,48,153,39,4,136,76,76,192,16
 9,2,141                                AL
·160 DATA32,208,96,169,5,141,32,208,96  NC
```

THE HAUNTED CASTLE

FROM PAGE 60

```
·0 DIMM,U,D$(3,1),W$(3),W(3),TR(10,1),S(1
 0,1),S$(1):FORA=0TO3:READD$(A,0):NEXT  LO
·1 DEFFNR(X)=INT(RND(1)*X):SD=2040:DR=685
 :S=53248:SO=54272:POKESO+24,15         FH
·2 POKES+39,9:POKES+16,0:DATA"[HOME][4"[D
 OWN]"][17"[RIGHT]"]","[HOME][13"[DOWN]"]
 [LEFT]"                                NH
·3 POKESD,245:DATA"[HOME][24"[DOWN]"][17"
 [RIGHT]"]","[HOME][12"[DOWN]"]"        KI
·4 POKES,171:W$(0)=D$(0,0)+"[RVSON][c 4][
 6" "]":W$(1)=D$(1,0)+"[RVSON][c 4] [DOWN
 ][LEFT] [DOWN][LEFT] [DOWN][LEFT] [DOWN]
 [LEFT] ":A=RND(-TI)                    HM
·5 POKES+1,158:W$(2)=D$(2,0)+"[RVSON][c 4
 ][6" "][HOME]":W$(3)=D$(3,0)+"[RVSON][c
 4] [DOWN][LEFT] [DOWN][LEFT] [DOWN][LEFT
 ] [DOWN][LEFT] "                       DC
·6 POKES+27,1:D$(0,1)=D$(0,0)+"[6" "]":D$
 (1,1)=D$(1,0)+" [DOWN][LEFT] [DOWN][LEFT
 ] [DOWN][LEFT] [DOWN][LEFT] "          CE
·7 POKES+28,1:D$(2,1)=D$(2,0)+"[6" "][HOM
 E]":D$(3,1)=D$(3,0)+" [DOWN][LEFT] [DOWN
 ][LEFT] [DOWN][LEFT] [DOWN][LEFT] "    PG
·8 D$(1,0)=D$(1,0)+"[c 2][RVSON][s -][DOW
 N][LEFT][s -][DOWN][LEFT][s -][DOWN][LEF
 T][s -][DOWN][LEFT][s W]":D$(3,0)=D$(3,0
 )+"[c 2][RVSON][s W][DOWN][LEFT][s -][DO
 WN][LEFT][s -][DOWN][LEFT][s -][DOWN][LE
 FT][s -]                               ME
·9 D$(2,0)=D$(2,0)+"[c 2][RVSON][s W][5"[
 s *]"][HOME]":D$(0,0)=D$(0,0)+"[c 2][RVS
 ON][5"[s *]"][s W]":POKES+38,7         AC
·10 PRINT"[CLEAR][3"[DOWN]"][7"[RIGHT]"]P
 LEASE WAIT, READING DATA.":GOSUB96:GOSUB
 66:GOTO86                              GF
·11 PRINT"[CLEAR][4"[DOWN]"][c 4][RVSON][
 17" "][6"[RIGHT]"][17" "]";:GOSUB157:U=6
 84                                     FJ
·12 PRINT"[4"[DOWN]"]":GOSUB157:PRINT"[17
 " "][6"[RIGHT]"][16" "][HOME]          BC
·13 POKE2023,160:POKE56295,11:FORA=679TO6
 95:POKEA,0:NEXT:POKEDR,2:POKE687,1     KF
·14 SL=49176:SR=49196:XR=781:M=49750:P=49
 496:POKES+21,1                         NL
·15 GOSUB44:GOSUB39:POKES+30,0:POKES+31,0
 :GOSUB80:GOSUB81:GOTO79                DK
·16 SYSM:ONPEEK(U)+1GOTO16,17,19,21,23,25
 ,32                                    AM
·17 Y=Y-1:FORA=0TO7:POKES+1,PEEK(S+1)-1:S
 YSP:NEXT:POKES+1,255:GOSUB44           NA
·18 FORA=0TO35:POKES+1,PEEK(S+1)-1:SYSP:N
 EXT:GOSUB39:GOTO79                     FC
```

```
·19 X=X+1:FORA=0TO7:POKEXR,0:SYSSR:SYSP:N
EXT:POKES,0:POKES+16,0:GOSUB44          LL
·20 FORA=0TO35:POKEXR,0:SYSSR:SYSP:NEXT:G
OSUB39:GOTO79                           NE
·21 Y=Y+1:FORA=0TO24:POKES+1,PEEK(S+1)+1:
SYSP:NEXT:GOSUB44:POKES+1,89            LG
·22 FORA=0TO12:POKES+1,PEEK(S+1)+1:SYSP:N
EXT:GOSUB39:GOTO79                      GO
·23 X=X-1:FORA=0TO7:POKEXR,0:SYSSL:SYSP:N
EXT:POKES+16,1:POKES,82:GOSUB44         LG
·24 FORA=0TO33:POKEXR,0:SYSSL:SYSP:NEXT:G
OSUB39:GOTO79                           FA
·25 ONSS+1GOTO16,26,29                  EP
·26 Z=Z+1:POKESD,250:POKEDR,1:POKE687,1:P
OKES,127:POKES+1,119:FORA=1TO5          HF
·27 POKES,PEEK(S)-16:POKES+1,PEEK(S+1)-8:
FORT=0TO9:NEXT:NEXT:POKES,0:POKES+1,0   OB
·28 GOSUB54:SS=0:POKES,238:POKES+1,174:GO
TO15                                    KE
·29 POKESD,245:POKEDR,2:POKE687,1:Z=Z-1:P
OKES,238:POKES+1,174:FORA=1TO5          IB
·30 POKES+1,PEEK(S+1)+8:B=PEEK(S)+16:IFB=
270THENB=15:POKES+16,PEEK(S+16)OR1      JC
·31 POKES,B:NEXT:GOSUB54:SS=0:POKES,127:P
OKES+1,119:POKES+16,0:GOTO15            EF
·32 ONTR+1GOTO16,33,36                  CB
·33 TC=TC+1:GOSUB80:POKES+30,0:TR(Z,0)=10
:TR(Z,1)=10:GOSUB84:GOSUB153:POKESO+5,8 BP
·34 POKESO+6,255:POKESO+4,23:C=3.5+TC:GOS
UB154:POKES+21,1:POKESO+6,15            GH
·35 POKES+30,0:GOTO16                   II
·36 ON-(TC=0)GOTO90:TC=TC-1:POKES+21,1:PO
KE689,0:A=FNR(10):B=FNR(10)             KK
·37 C=FNR(11):IFTR(C,0)<>10THEN37       BD
·38 TR(C,0)=A:TR(C,1)=B:POKES+30,0:GOSUB8
0:GOTO16                                FL
·39 POKES+31,0:C=FNR(3):FORA=0TOC       OD
·40 B=FNR(4):ONPEEK(680+B)+1GOTO40      JK
·41 POKE680+B,0:CL=CL+1:IFCL=3THENA=C   PM
·42 NEXT:FORA=0TO3:IFW(A)=1THENW(A)=0:NEX
T:RETURN                                JH
·43 PRINTD$(A,PEEK(680+A)):NEXT:RETURN  PC
·44 POKES+21,1:CL=0:FORA=0TO3:POKE680+A,1
:NEXT:IFX=0THENPOKE683,0:W(3)=1:CL=CL+1 MI
·45 IFX=9THENPOKE681,0:W(1)=1:CL=CL+1   FM
·46 IFY=0THENPOKE680,0:W(0)=1:CL=CL+1   LC
·47 IFY=9THENPOKE682,0:W(2)=1:CL=CL+1   HH
·48 FORA=0TO3:IFW(A)=1THENPRINTW$(A):GOTO
50                                      BB
·49 PRINTD$(A,1)                        PD
·50 NEXT:ON-(TC=3)GOSUB76:IFTR=1THENTR=0 KN
·51 IFTR(Z,0)=XANDTR(Z,1)=YTHEN61       HF
·52 IFTR=2THENTR=0:POKE689,0            PC
·53 IFSS=0THEN56                        CI
·54 PRINT"[HOME][5"[DOWN]"]";:FORA=1TO19:
PRINT"[RIGHT][38" "][RIGHT]";           HI
·55 NEXT:PRINT"[HOME]":SS=0             HC
·56 IFZ=0THEN59                         OL
·57 IFS(Z,0)=XANDS(Z,1)=YTHENPRINTS$(1)ST
$:SS=2:GOTO63                           GE
·58 IFZ=10THEN63                        BH
·59 IFS(Z+1,0)=XANDS(Z+1,1)=YTHENPRINTS$(
0)ST$:SS=1                              PO
·60 GOTO63                              PD
·61 POKES+40,5:POKESD+1,253:POKES+2,173:P
OKES+3,150:POKES+21,3:TR=1:POKE689,0    HG
·62 GOTO52                              PB
·63 IFTR=1ORFNR(100)>24OR(X=0ANDY=0ANDZ=0
)THENRETURN                             JI
·64 POKES+2,173:POKES+3,150:POKES+40,1:PO
KESD+1,251:POKES+21,3:POKE689,1:TR=2    LK
·65 RETURN                              IM
·66 ST$="[RVSON][CYAN]":FORA=1TO6:SB$="[D
OWN]":FORB=1TOA:ST$=ST$+"  ":SB$=SB$+"[L
EFT][LEFT]":NEXT                        MI
·67 ST$=ST$+SB$:NEXT:S$(0)="[HOME][5"[DOW
N]"][RIGHT]":S$(1)="[HOME][18"[DOWN]"][R
IGHT]                                   GD
·68 S$(1)=S$(1)+"[12"[RIGHT]"]":ST$=ST$+"
[HOME]":GOSUB75:FORA=1TO3:B=FNR(10)     KM
·69 C=FNR(10):D=FNR(11):IFTR(D,0)=BANDTR(
D,1)=CTHENA=A-1:NEXT                    DL
·70 TR(D,0)=B:TR(D,1)=C:NEXT:FORA=1TO9:S(
A,0)=FNR(10):S(A,1)=FNR(10)             KK
·71 IFS(A,0)=TR(A,0)ANDS(A,1)=TR(A,1)THEN
A=A-1:NEXT                              LN
·72 IFS(A,0)=TR(A+1,0)ANDS(A,1)=TR(A+1,1)
THENA=A-1:NEXT                          GN
·73 IFS(A,0)=S(A-1,0)ANDS(A,1)=S(A-1,1)TH
ENA=A-1:NEXT                            IK
·74 NEXT:RETURN                         EJ
·75 FORA=0TO10:TR(A,0)=10:TR(A,1)=10:NEXT
:RETURN                                 NM
·76 IFX<>0ORY<>0ORZ<>0THENRETURN        AB
·77 POKES+21,0:PRINT"[HOME][7"[DOWN]"][CY
AN]"SPC(12)"CONGRATULATIONS!            GJ
·78 PRINT"[DOWN][c 1][3"[RIGHT]"]YOU HAVE
 FOUND ALL THE TREASURES!":GOTO93       DJ
·79 PRINT"[HOME][DOWN][c 6][10"[RIGHT]"]R
OOM #"STR$(Y)MID$(STR$(X),2,1)"  LEVEL"Z
"[LEFT] ":GOTO16                        OD
·80 PRINT"[HOME][PURPLE][13"[RIGHT]"]TREA
SURES:"TC:RETURN                        HH
·81 US$="NONE":IFZ<10THENUS$="#"+STR$(S(Z
+1,1))+MID$(STR$(S(Z+1,0)),2,1)         CD
·82 DS$="NONE":IFZ>0THENDS$="#"+STR$(S(Z,
1))+MID$(STR$(S(Z,0)),2,1)              BH
·83 PRINT"[HOME][3"[DOWN]"][7"[RIGHT]"][c
 3]STAIRS: UP-"US$"  DOWN-"DS$          PG
·84 TR$="[RED]NONE":IFTR(Z,0)<>10THENTR$=
"[GREEN]#"+STR$(TR(Z,1))+MID$(STR$(TR(Z,
0)),2,1)                                GM
·85 PRINT"[HOME][DOWN][DOWN][BLUE][8"[RIG
HT]"]TREASURE LOCATION: "TR$:RETURN     HA
·86 POKES+32,0:POKES+33,0:PRINT"[CLEAR][4
"[DOWN]"][PURPLE]"SPC(11)"THE HAUNTED CA
```

```
STLE                                          EJ
·87 PRINT"[3"[DOWN]"][c 6][4" "]PRESS THE
 [RED]FIRE[c 6] BUTTON WHEN READY[HOME]"
 CHR$(142)CHR$(8)                             OB
·88 IF(PEEK(56320)AND16)=16THEN88             OC
·89 GOTO11                                    PG
·90 GOSUB153:POKESO+5,8:POKESO+6,255:POKE
 SO+4,23:POKESO+15,9:FORA=1TO25               JA
·91 POKES+39,FNR(16):POKES+38,FNR(16):GOS
 UB156:NEXT:POKESO+6,15:POKES+21,0            LE
·92 PRINT"[HOME][7"[DOWN]"]"SPC(11)"[CYAN
 ]THE GHOST GOT YOU![DOWN]                    KJ
·93 PRINTSPC(9)"[DOWN][DOWN][YELLOW]PUSH
 UP TO PLAY AGAIN":PRINTSPC(11)"[DOWN]PUS
 H DOWN TO STOP                               PO
·94 A=PEEK(56320):IFA=126THENRUN              HP
·95 ON(A=125)+1GOTO94:SYS2048                 MH
·96 IFPEEK(49759)=96THENRETURN                PA
·97 FORA=15680TO16255:READB:POKEA,B:NEXT:
 FORA=49152TO49759:READB:POKEA,B:NEXT         DA
·98 RETURN                                    IM
·99 DATA0,,,,,,,252,,3,51,,15,255,192,,16
 8,,,168,,,168,,,252,,3                       MB
·100 DATA255,,3,255,192,15,255,224,47,255
 ,32,32,,,3,255,,3,207,,15,3,192,60           BA
·101 DATA3,192,42,2,160,,,,,,,144,,,,,,,,
 252,,3,51,,15,255,192,                       AH
·102 DATA168,,,168,,,168,,,252,,3,255,,3,
 255,,3,255,,3,239,,,32,,3                    NL
·103 DATA255,,3,207,,3,207,,3,207,,2,170,
 128,,,,,,,144,,,,,,,                         AB
·104 DATA252,,3,51,,15,255,192,,168,,,168
 ,,,168,,,252,,3,255,,3,255,                  AK
·105 DATA11,255,,11,255,128,,,128,3,255,,
 3,207,,,252,,                                AD
·106 DATA252,,,170,,,,,,,144,,,,,,,,63,,
 ,204,192,3,255,240                           BO
·107 DATA0,42,,,42,,,42,,,63,,,255,192,,2
 55,192,,255,224,2,255,224,2                  PL
·108 DATA0,,,255,192,,243,192,,63,,,63,,,
 170,,,,,,,,144,,,,                           BI
·109 DATA0,,,63,,,204,192,3,255,240,,42,,
 ,42,,,42,,,63,,,255,192                      EB
·110 DATA0,255,192,,255,192,,251,192,,8,,
 ,255,192,,243,192,,243,192,                  NK
·111 DATA243,192,2,170,128,,,,,,,144,,,,,
 ,,,63,,,204,192,3,255                        IE
·112 DATA240,,42,,,42,,,42,,,63,,,255,192
 ,3,255,192,11,255,240,8,255                  JA
·113 DATA248,,,8,,255,192,,243,192,3,192,
 240,3,192,60,10,128,168,,,,,                 IL
·114 DATA0,144,,48,,,120,,,252,,1,182,,1,
 254,,3,255,,3,255,128,7,255                  AD
·115 DATA192,7,255,192,15,255,224,15,255,
 224,7,255,224,7,255,192,3,255,128,3          EK
·116 DATA255,,7,252,,15,224,,62,,,,,,,,,,
 ,,,,12,,,30,,,63                             AE
·117 DATA0,,109,128,,127,192,,255,192,1,2
 55,224,1,255,240,3,255,240,3,255             CK
·118 DATA240,3,255,248,3,255,248,1,255,24
 8,,255,240,,63,248,,15,252,,,254             EL
·119 DATA0,,31,,,,,,,,,,,,,,,,7,128,,31
 ,192,,127,224,1                              IJ
·120 DATA255,240,7,255,240,9,255,192,14,2
 55,48,22,252,240,27,115,240,29,79,240        BM
·121 DATA30,63,240,31,127,240,31,127,224,
 31,127,192,15,127,,7,124,,3,112,,1           MI
·122 DATA64,,,,,                              NA
·123 DATA1,254,2,253,4,251,8,247,16,239,3
 2,223,64,191,128,127,222,1,208,96,254        NE
·124 DATA1,208,96,189,,208,201,,208,9,173
 ,16,208,61,1,192,141,16,208,222,             MA
·125 DATA208,96,189,,208,201,255,208,9,17
 3,16,208,29,,192,141,16,208,254,             LF
·126 DATA208,96,162,,142,172,2,142,176,2,
 173,31,208,9,254,201,255,208,6,169,5         KA
·127 DATA141,172,2,96,173,30,208,9,254,20
 1,255,208,6,169,6,141,172,2,96,173,          IC
·128 DATA220,41,15,201,14,240,21,201,13,2
 40,53,201,11,240,85,201,7,240,6,169,1        BH
·129 DATA141,176,2,96,76,18,193,173,1,208
 ,201,88,240,4,32,16,192,96,173,,208          KF
·130 DATA201,155,144,234,201,190,144,1,96
 ,173,168,2,201,1,208,222,169,1,141           ED
·131 DATA172,2,96,173,1,208,201,223,240,4
 ,32,20,192,96,173,,208,201,155,144           LN
·132 DATA198,201,190,144,1,96,173,170,2,2
 01,1,208,186,169,3,141,172,2,96,173,         ME
·133 DATA208,201,29,240,29,173,173,2,201,
 2,240,9,169,1,141,173,2,32,24,192,96         KC
·134 DATA169,250,141,248,7,169,1,141,175,
 2,76,218,192,173,16,208,9,254,201,255        DG
·135 DATA240,218,173,1,208,201,145,144,87
 ,201,168,144,1,96,173,171,2,201,1,208        BG
·136 DATA75,169,4,141,172,2,96,173,,208,2
 01,59,240,29,173,173,2,201,1,240,9           MJ
·137 DATA169,2,141,173,2,32,44,192,96,169
 ,245,141,248,7,169,1,141,175,2,76,32         NE
·138 DATA193,173,16,208,9,254,201,255,208
 ,218,173,1,208,201,145,144,17,201,168        DI
·139 DATA144,1,96,173,169,2,201,1,208,5,1
 69,2,141,172,2,96,173,176,2,208,29           IA
·140 DATA238,174,2,173,174,2,201,5,208,19
 ,169,,141,174,2,173,173,2,201,1,240          OA
·141 DATA10,201,2,240,56,76,222,193,76,22
 2,193,173,175,2,201,1,240,7,201,2,240        EA
·142 DATA21,76,222,193,169,1,141,175,2,17
 3,248,7,201,248,240,6,206,248,7,76           PO
·143 DATA222,193,169,2,141,175,2,173,248,
 7,201,250,240,226,238,248,7,76,222           NH
·144 DATA193,173,175,2,201,1,240,7,201,2,
 240,21,76,222,193,169,1,141,175,2,173        JG
·145 DATA248,7,201,247,240,6,238,248,7,76
 ,222,193,169,2,141,175,2,173,248,7           BM
·146 DATA201,245,240,226,206,248,7,169,,1
 41,31,208,141,30,208,96,173,177,2            EE
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 113 and 116 explain these codes and provide other essential information on entering ***Ahoy!*** programs. Refer to these pages **before** entering any programs!

```
·147 DATA201,1,208,103,238,178,2,173,178,
2,201,2,208,93,169,,141,178,2,173,16      BI
·148 DATA208,9,254,201,255,208,9,173,16,2
08,9,253,201,255,208,39,173,16,208,9      KO
·149 DATA254,201,255,240,9,173,16,208,9,2
53,201,255,240,8,173,2,208,205,,208       LF
·150 DATA144,13,162,2,32,24,192,169,252,1
41,249,7,76,64,194,162,2,32,44,192        CN
·151 DATA169,251,141,249,7,173,3,208,205,
1,208,176,8,162,2,32,20,192,76,85,194     BL
·152 DATA162,2,32,16,192,96,32,231,193,32
,64,192,32,88,193,96                      NH
·153 FORA=SOTOSO+23:POKEA,0:NEXT:RETURN   IA
·154 POKESO+15,C:FORB=1TO160STEP2:FORT=0T
O29:NEXT:POKESO+1,B:POKES+40,FNR(16)      DJ
·155 NEXT:RETURN                          EJ
·156 POKESO+1,FNR(256):POKESO,FNR(200):RE
TURN                                      LB
·157 FORA=1TO7:PRINT"[RVSON] "SPC(38)" ";
:NEXT:RETURN                              AD
```

KNOCKOUT
FROM PAGE 70

Beginning address in Hex: C000
Ending address in Hex: C61A
SYS to start: 49152

```
C000: A9 00 A0 3F 99 C0 3C 88 A8
C008: 10 FA A0 00 B9 1B C5 99 E7
C010: 00 3D C8 D0 F7 A2 00 8E 10
C018: 0F C5 B9 00 3D F0 16 0A F4
C020: 90 0B 48 AD 0F C5 1D 99 3D
C028: C4 8D 0F C5 68 E8 E0 08 89
C030: D0 ED AD 0F C5 48 98 49 9B
C038: FF A8 68 99 FF 3D 98 49 02
C040: FF A8 C8 D0 D0 A9 80 85 03
C048: FB A9 3D 85 FC A9 FC 85 D9
C050: FD A9 3F 85 FE A9 04 8D F6
C058: 0F C5 A2 00 A0 02 B1 FB 20
C060: 91 FD 88 10 F9 18 A5 FB 3C
C068: 69 03 85 FB A5 FC 69 00 62
C070: 85 FC 38 A5 FD E9 03 85 41
C078: FD A5 FE E9 00 85 FE E8 72
C080: E0 15 D0 D8 E6 FB D0 02 D5
C088: E6 FC C6 FD D0 02 C6 FE C9
C090: CE 0F C5 D0 C5 A0 00 B9 25
C098: E7 C4 99 00 D4 C8 C0 19 56
C0A0: D0 F5 A9 01 8D 1A C5 78 F7
C0A8: A9 7F 8D 0D DC A9 01 8D 81
C0B0: 1A D0 A9 EB 8D 12 D0 A9 4B
C0B8: 1B 8D 11 D0 A9 F1 8D 14 80
C0C0: 03 A9 C3 8D 15 03 58 A9 D8
C0C8: 0B 8D 20 D0 8D 21 D0 A9 7B
C0D0: 00 8D 15 D0 A9 61 A0 C4 B4
C0D8: 20 1E AB 20 E3 C3 8D 04 1C
C0E0: C5 F0 15 A9 74 A0 C4 20 50
C0E8: 1E AB 20 E3 C3 AA BD A1 84
C0F0: C4 8D 05 C5 0A 8D 06 C5 71
C0F8: A9 93 20 D2 FF A9 00 85 58
C100: FD A9 DB 85 FE A2 04 A0 4F
C108: E7 A9 07 91 FD 88 D0 FB 85
C110: 91 FD C6 FE CA D0 F4 A9 9F
C118: 40 A0 1C 99 55 04 99 75 17
C120: 07 88 D0 F7 A9 7D 85 FD 23
C128: A9 04 85 FE A2 13 A9 5D 17
C130: A0 00 91 FD A0 1D 91 FD AD
C138: 18 A5 FD 69 28 85 FD A5 AE
C140: FE 69 00 85 FE CA D0 E6 AF
C148: A9 A0 8D 55 04 8D 72 04 7D
C150: 8D 75 07 8D 92 07 A9 00 2B
C158: A0 03 99 3A D8 88 10 FA 3C
C160: A9 3A 8D 3B 04 A0 03 B9 6E
C168: C9 C4 99 00 C5 B9 CD C4 A2
C170: 99 07 C5 88 10 F1 A9 00 0B
C178: 8D 28 D0 8D 2A D0 A0 02 2A
C180: 99 08 DC 88 10 FA A0 0F 42
C188: 99 0B C5 88 10 FA A9 01 31
C190: 8D 27 D0 8D 29 D0 AE 3C 88
C198: 04 E0 20 F0 F9 A9 0F 8D CE
C1A0: 17 D0 8D 1D D0 8D 15 D0 77
C1A8: 20 D9 C3 20 AE C3 AD 1E C4
C1B0: D0 A2 01 BD 0D C5 F0 0A B0
C1B8: DE 0D C5 BD 0B C5 A8 4C ED
C1C0: E0 C1 8A F0 13 AD 04 C5 69
C1C8: F0 0E AD 10 C5 29 0C 4A CA
C1D0: 4A A8 B9 DB C4 A8 D0 08 9F
C1D8: BD 00 DC 29 0F 49 0F A8 AC
C1E0: BD 00 C5 18 79 B3 C4 C9 38
C1E8: 44 90 07 C9 FD B0 03 9D DD
C1F0: 00 C5 BD 02 C5 18 79 BE 8C
C1F8: C4 C9 47 90 07 C9 BC B0 9D
C200: 03 9D 02 C5 CA 10 AC AD 9D
C208: 1E D0 F0 09 20 3A C3 AD BC
C210: 1E D0 4C 18 C2 8D 17 C5 90
C218: EE 12 C5 AD 12 C5 29 03 90
C220: F0 03 4C E9 C2 A0 01 B9 68
C228: 10 C5 29 03 AA BD DF C4 37
C230: 99 13 C5 BD E3 C4 99 15 B7
C238: C5 88 10 EB AC 11 C5 AD B3
C240: 10 C5 AE 02 C5 EC 03 C5 42
C248: 90 0D 0D 15 C5 48 98 2D DB
C250: 14 C5 A8 68 4C 61 C2 2D D8
C258: 13 C5 48 98 0D 16 C5 A8 A3
C260: 68 AE 00 C5 EC 01 C5 90 81
C268: 0B 09 08 48 98 29 F7 A8 2F
C270: 68 4C 7C C2 29 F7 48 98 66
C278: 09 08 A8 68 8D 10 C5 8C 8A
```

```
C280: 11 C5 A0 01 B9 10 C5 AA 33
C288: 98 F0 1D AD 04 C5 F0 18 AF
C290: AD 03 C5 38 ED 05 C5 CD C5
C298: 02 C5 B0 27 18 6D 06 C5 89
C2A0: CD 02 C5 90 1E 4C AF C2 A3
C2A8: B9 00 DC 29 10 D0 14 8A E7
C2B0: 29 03 18 69 01 29 03 8D 19
C2B8: 0F C5 8A 29 0C 0D 0F C5 2F
C2C0: 4C C6 C2 8A 29 0C 29 0F 8E
C2C8: 99 10 C5 AA BD A3 C4 99 A2
C2D0: 07 C5 B9 0D C5 C9 0A B0 AE
C2D8: 0D 8A 29 08 4A 4A 4A AA 2B
C2E0: BD D1 C4 99 09 C5 88 10 36
C2E8: 9B A2 0E A0 E6 88 D0 FD 14
C2F0: CA 10 F8 AD 1A C5 D0 03 26
C2F8: 4C B1 C1 A9 00 8D 0B D4 CF
C300: 20 D9 C3 A2 01 BD 10 C5 F4
C308: 29 0C A8 B9 A3 C4 9D F8 9E
C310: 07 98 29 08 4A 4A 4A A8 68
C318: B9 D1 C4 9D FA 07 CA 10 E2
C320: E4 A2 17 A0 09 18 20 F0 91
C328: FF A9 82 A0 C4 20 1E AB A3
C330: 20 E4 FF C9 88 D0 F9 4C 9E
C338: CF C0 8D 0F C5 AE 17 C5 B6
C340: D0 0C A2 80 8E 0B D4 E8 97
C348: 8E 0B D4 8E 17 C5 A0 01 C3
C350: B9 0D C5 09 06 99 0D C5 58
C358: B9 10 C5 29 0C 4A 4A AA 5C
C360: BD D7 C4 99 0B C5 88 10 BD
C368: E7 AD 0F C5 29 0C F0 68 61
C370: A2 00 A0 01 AD 0F C5 39 70
C378: D3 C4 F0 2E A9 0F 99 0D 8F
C380: C5 A9 F3 99 09 C5 99 FA E0
C388: 07 FE 18 C5 BD 18 C5 C9 D1
C390: 64 90 17 EE 1A C5 BD D5 FE
C398: C4 A8 A9 0B 99 00 04 A9 02
C3A0: 0F C8 99 00 04 68 68 4C 33
C3A8: FB C2 E8 88 10 C6 A2 00 52
C3B0: A0 0A 18 20 F0 FF A9 01 2F
C3B8: 8D 86 02 AE 18 C5 A9 00 05
C3C0: 20 CD BD A2 00 A0 1C 18 E3
C3C8: 20 F0 FF A9 00 8D 86 02 99
C3D0: AE 19 C5 A9 00 20 CD BD B3
C3D8: 60 A0 15 8C 04 D4 88 8C 69
C3E0: 04 D4 60 20 E4 FF C9 31 1A
C3E8: F0 04 C9 32 D0 F5 29 01 CA
C3F0: 60 A9 01 8D 19 D0 AD 1A 3B
C3F8: C5 D0 59 AD 00 C5 8D 00 E9
C400: D0 8D 04 D0 AD 02 C5 8D 36
C408: 01 D0 8D 05 D0 AD 01 C5 B1
C410: 8D 02 D0 8D 06 D0 AD 03 85
C418: C5 8D 03 D0 8D 07 D0 A0 45
C420: 03 B9 07 C5 99 F8 07 88 CB
C428: 10 F7 AD 0A DC F0 0E C9 8D
C430: 02 90 03 EE 1A C5 29 0F CC
C438: 09 30 8D 3A 04 AD 09 DC D0
C440: AA 29 F0 4A 4A 4A 4A 09 37
C448: 30 8D 3C 04 8A 29 0F 09 12
C450: 30 8D 3D 04 AD 0D DC 29 10
C458: 01 F0 03 4C 31 EA 4C BC BE
C460: FE 8E 08 93 90 50 4C 41 F7
C468: 59 45 52 53 3F 20 28 31 65
C470: 2F 32 29 00 93 4C 45 56 76
C478: 45 4C 3F 20 28 31 2F 32 24
C480: 29 00 50 52 45 53 53 20 58
C488: 46 37 20 46 4F 52 20 41 6F
C490: 20 52 45 4D 41 54 43 48 B6
C498: 00 01 02 04 08 10 20 40 18
C4A0: 80 12 0E F5 FF FE FF F5 2C
C4A8: F6 F7 F6 FA F9 F8 F9 FA 71
C4B0: FC FD FC 00 00 00 00 FF A8
C4B8: FF FF 00 01 01 01 00 FF BB
C4C0: 01 00 00 FF 01 00 00 FF C2
C4C8: 01 46 FA 49 B9 F5 FA F4 F3
C4D0: FB F4 FB 04 08 0A 1C 06 F5
C4D8: 05 0A 09 05 06 09 0A FB 0B
C4E0: FF FF FF 04 00 00 00 00 E4
C4E8: 8F 00 00 00 01 0A 00 29 AC
C4F0: 00 00 00 22 00 00 20 00 33
C4F8: 00 00 00 00 00 00 00 0F 08
C500: 00 00 00 00 00 00 00 00 00
C508: 00 00 00 00 00 00 00 00 08
C510: 00 00 00 00 00 00 00 00 10
C518: 00 00 00 00 00 00 00 00 18
C520: 00 00 00 00 00 00 00 00 20
C528: 00 00 00 00 00 00 00 00 28
C530: 00 00 00 00 00 00 00 10 40
C538: 00 00 0C 00 00 10 00 00 54
C540: 00 00 00 00 00 00 00 00 40
C548: 00 00 00 00 00 00 00 00 48
C550: 00 00 00 00 00 00 00 00 50
C558: 00 00 00 00 7C 00 00 FE D3
C560: 00 7F FE 00 7F FE 00 3C 99
C568: F8 00 1E 7C 00 0F 00 00 0B
C570: 0F 00 00 1F E0 00 3F E0 9F
C578: 00 3F F0 00 3F E0 00 1F E7
C580: E0 00 0F 00 00 0F 00 00 7F
C588: 1E 7C 00 3C F8 00 7F FE D6
C590: 00 7F FE 00 00 FE 00 00 0E
C598: 7C 00 00 00 00 00 00 03 18
C5A0: E0 00 07 F0 01 FF F0 03 6E
C5A8: FF F0 07 87 C0 0F 03 E0 DB
C5B0: 0F 00 00 1F E0 00 3F E0 DF
C5B8: 00 3F F0 00 3F E0 00 1F 28
C5C0: E0 00 0F 00 00 0F 00 00 BF
C5C8: 1E 7C 00 3C F8 00 7F FE 17
C5D0: 00 7F FE 00 00 FE 00 00 4E
C5D8: 7C 00 00 00 00 00 00 00 55
C5E0: 00 00 00 3E 00 00 7F 00 9E
C5E8: 3F FF 00 FF FF 03 E0 7C 88
C5F0: 07 C0 3E 1F E0 00 3F E0 17
C5F8: 00 3F F0 00 3F E0 00 1F 68
C600: E0 00 0F 00 00 0F 00 00 FE
C608: 1E 7C 00 3C F8 00 7F FE 56
C610: 00 7F FE 00 00 FE 00 00 8D
C618: 7C 00 00 94
```

SKETCHER FROM PAGE 92

An assembler is required for entry of this program! See introductory article beginning on page 92.

```
*
* SKETCHER
*
         ORG   $8000
*
COLOR    EQU   $10
BASE     EQU   $2000
SCROLY   EQU   $D011
VMCSB    EQU   $D018
COLMAP   EQU   $0400
*
HMAX     EQU   320
VMAX     EQU   200
HMID     EQU   160
VMID     EQU   100
*
SCRLEN   EQU   8000
MAPLEN   EQU   1000
*
TEMPA    EQU   $FB
TEMPB    EQU   TEMPA+2
*
TABPTR   EQU   TEMPA
TABSIZ   EQU   $9000
*
HPSN     EQU   TABSIZ+2
VPSN     EQU   HPSN+2
CHAR     EQU   VPSN+1
ROW      EQU   CHAR+1
LINE     EQU   ROW+1
BYTE     EQU   LINE+1
BITT     EQU   BYTE+2
*
MPRL     EQU   BITT+1
MPRH     EQU   MPRL+1
MPDL     EQU   MPRH+1
MPDH     EQU   MPDL+1
PRODL    EQU   MPDH+1
PRODH    EQU   PRODL+1
*
FILVAL   EQU   PRODH+1
JSV      EQU   FILVAL+1
*
CIAPRA   EQU   $DC00
*
         JMP   START
*
* BLOCK FILL ROUTINE
*
BLKFIL   LDA   FILVAL
         LDX   TABSIZ+1
         BEQ   PARTPG
         LDY   #0
FULLPG   STA   (TABPTR),Y
         INY
         BNE   FULLPG
         INC   TABPTR+1
         DEX
         BNE   FULLPG
PARTPG   LDX   TABSIZ
         BEQ   FINI
         LDY   #0
PARTLP   STA   (TABPTR),Y
         INY
         DEX
         BNE   PARTLP
FINI     RTS
*
* 16-BIT MULTIPLICATION ROUTINE
*
MULT16   LDA   #0
         STA   PRODL
         STA   PRODH
         LDX   #17
         CLC
MULT     ROR   PRODH
         ROR   PRODL
         ROR   MPRH
         ROR   MPRL
         BCC   CTDOWN
         CLC
         LDA   MPDL
         ADC   PRODL
         STA   PRODL
         LDA   MPDH
         ADC   PRODH
         STA   PRODH
CTDOWN   DEX
         BNE   MULT
         RTS
*
* PLOT ROUTINE
*
* ROW=VPSN/8 (8-BIT DIVIDE)
*
PLOT     LDA   VPSN
         LSR   A
         LSR   A
         LSR   A
         STA   ROW
*
* CHAR=HPSN/8 (16-BIT DIVIDE)
*
         LDA   HPSN
         STA   TEMPA
         LDA   HPSN+1
         STA   TEMPA+1
         LDX   #3
DLOOP    LSR   TEMPA+1
         ROR   TEMPA
         DEX
         BNE   DLOOP
         LDA   TEMPA
         STA   CHAR
*
* LINE=VPSN AND 7
*
         LDA   VPSN
         AND   #7
         STA   LINE
*
* BITT=7-(HPSN AND 7)
*
         LDA   HPSN
         AND   #7
         STA   BITT
         SEC
         LDA   #7
         SBC   BITT
         STA   BITT
*
* BYTE=BASE+ROW*HMAX+8*CHAR+LINE
*
* FIRST MULTIPLY ROW * HMAX
*
         LDA   ROW
         STA   MPRL
         LDA   #0
         STA   MPRH
         LDA   #<HMAX
         STA   MPDL
         LDA   #>HMAX
         STA   MPDH
         JSR   MULT16
         LDA   MPRL
         STA   TEMPA
         LDA   MPRL+1
         STA   TEMPA+1
*
* ADD PRODUCT TO BASE
*
         CLC
         LDA   #<BASE
         ADC   TEMPA
         STA   TEMPA
         LDA   #>BASE
         ADC   TEMPA+1
         STA   TEMPA+1
*
* MULTIPLY 8 * CHAR
*
         LDA   #8
         STA   MPRL
         LDA   #0
         STA   MPRH
         LDA   CHAR
         STA   MPDL
         LDA   #0
         STA   MPDH
         JSR   MULT16
         LDA   MPRL
         STA   TEMPB
         LDA   MPRH
         STA   TEMPB+1
*
* ADD LINE
*
         CLC
         LDA   TEMPB
         ADC   LINE
         STA   TEMPB
         LDA   TEMPB+1
         ADC   #0
         STA   TEMPB+1
*
* BYTE = TEMPA + TEMPB
*
         CLC
         LDA   TEMPA
         ADC   TEMPB
         STA   TEMPB
         LDA   TEMPA+1
         ADC   TEMPB+1
         STA   TEMPB+1
*
* POKE BYTE,PEEK(BYTE)OR2^BIT
*
         LDX   BITT
         INX
         LDA   #0
         SEC
SQUARE   ROL
         DEX
         BNE   SQUARE
         LDY   #0
         ORA   (TEMPB),Y
         STA   (TEMPB),Y
         RTS
*
* MAIN ROUTINE STARTS HERE
*
* FIRST DEFINE BIT MAP AND ENABLE
* HIGH-RESOLUTION GRAPHICS
*
START    LDA   #$18
         STA   VMCSB
*
         LDA   SCROLY
         ORA   #32
         STA   SCROLY
*
* SELECT GRAPHICS BANK 1
*
         LDA   $DD02
         ORA   #$03
         STA   $DD02
*
         LDA   $DD00
         ORA   #$03
         STA   $DD00
*
* CLEAR BIT MAP
*
         LDA   #0
         STA   FILVAL
         LDA   #<BASE
         STA   TABPTR
```

```
         LDA   #>BASE
         STA   TABPTR+1
         LDA   #<SCRLEN
         STA   TABSIZ
         LDA   #>SCRLEN
         STA   TABSIZ+1
         JSR   BLKFIL
*
* SET BKG AND LINE COLORS
*
         LDA   #COLOR
         STA   FILVAL
         LDA   #<COLMAP
         STA   TABPTR
         LDA   #>COLMAP
         STA   TABPTR+1
         LDA   #<MAPLEN
         STA   TABSIZ
         LDA   #>MAPLEN
         STA   TABSIZ+1
         JSR   BLKFIL
*
* PRINT DOT AT MIDSCREEN
*
         LDA   #VMID
         STA   VPSN
         LDA   #<HMID
         STA   HPSN
         LDA   #>HMID
         STA   HPSN+1
         JSR   PRINT
*
* READ JOYSTICK
*
* FIRST CHECK TRIGGER BUTTON
*
READJS   LDA   CIAPRA
         AND   #$10
         BEQ   START
*
* NOW READ JOYSTICK
*
         LDA   #$0F
         PHA
         AND   CIAPRA
         STA   JSV
         PLA
         SEC
         SBC   JSV
         STA   JSV
*
         TAX
         BEQ   READJS
         LDA   RELADS-1,X
         STA   MODREL+1
MODREL   BNE   *
MODR1
*
NIL1     JMP   READJS
*
* ROUTINES TO MOVE JOYSTICK
*
UP       JSR   MOVEUP
         JMP   DOIT
*
DOWN     JSR   MOVEDN
         JMP   DOIT
*
LEFT     LDX   HPSN
         LDY   HPSN+1
         TXA
         BNE   DECLSB
         DEY
DECLSB   DEX
         STX   HPSN
         STY   HPSN+1
         JMP   DOIT
*
UPANDL   JSR   MOVEUP
         JMP   LEFT
*
DNANDL   JSR   MOVEDN
         JMP   LEFT
*
NIL2     JMP   READJS
*
RIGHT    LDX   HPSN
         LDY   HPSN+1
         INX
         BNE   NOINC
         INY
NOINC    STX   HPSN
         STY   HPSN+1
         JMP   DOIT
*
UPANDR   JSR   MOVEUP
         JMP   RIGHT
*
DNANDR   JSR   MOVEDN
         JMP   RIGHT
*
* SUBROUTINES TO MOVE UP & DOWN
*
MOVEUP   LDX   VPSN
         DEX
         STX   VPSN
         RTS
*
MOVEDN   LDX   VPSN
         INX
         STX   VPSN
         RTS
*
* "DOIT" SUBROUTINE
*
DOIT     JSR   PRINT
         JMP   READJS
*
* MORE SUBROUTINES START HERE
*
* MAKE SURE DOT IS WITHIN RANGE
*
CHECK    LDA   VPSN
         BEQ   RAISE
         CMP   #VMAX-1
         BCS   LOWER
         JMP   HCHECK
RAISE    INC   VPSN
         JMP   HCHECK
LOWER    LDA   #VMAX-1
         STA   VPSN
*
HCHECK   BIT   HPSN+1
         BPL   OKLOW
         LDA   #1
         STA   HPSN
         LDA   #0
         STA   HPSN+1
         RTS
*
OKLOW    LDA   #<HMAX-2
         CMP   HPSN
         LDA   #>HMAX-2
         SBC   HPSN+1
         BCC   TOOHI
         RTS
*
TOOHI    LDA   #<HMAX-2
         STA   HPSN
         LDA   #>HMAX-2
         STA   HPSN+1
         RTS
*
* PRINT DOT ON SCREEN
*
PRINT    JSR   CHECK
         JSR   PLOT
*
         LDA   HPSN
         PHA
         LDA   HPSN+1
         PHA
*
         LDA   HPSN
         BNE   SKIP
         DEC   HPSN+1
SKIP     DEC   HPSN
         JSR   CHECK
         JSR   PLOT
*
         PLA
         STA   HPSN+1
         PLA
         STA   HPSN
         RTS
*
RELADS   DFB   UP-MODR1
         DFB   DOWN-MODR1
         DFB   NIL1-MODR1
         DFB   LEFT-MODR1
         DFB   UPANDL-MODR1
         DFB   DNANDL-MODR1
         DFB   NIL2-MODR1
         DFB   RIGHT-MODR1
         DFB   UPANDR-MODR1
         DFB   DNANDR-MODR1
*
```

ALARM CLOCK

FROM PAGE 99

```
·100 POKE56,158:CLR                                KA
·110 PRINT"[CLEAR][11"[DOWN]"][10"[RIGHT]
 "]ONE MOMENT PLEASE[3"."]"                        HA
·120 FORAD=40449TO40739:READOP:CK=CK+OP:P
 OKEAD,OP:NEXT                                     PG
·130 IFCK<>31161THENPRINT"[CLEAR]ERROR IN
  DATA STATEMENTS.":STOP                           NG
·140 PM=0:INPUT"[CLEAR]WHAT IS THE HOUR";
 H:IFH<0ORH>23THEN140                              HG
·150 IFH=0THENH=12:GOTO180                         CP
·160 IFH>12THENH=H-12:PM=-1                        IH
·170 IFPM=0THENGOSUB420                            NO
·180 IFH=12THENPM=NOT PM                           DE
·190 NUM=H:GOSUB370:POKE56331,-128*PM+16*
 FD+SD                                             KN
·200 INPUT"[DOWN]WHAT IS THE MINUTE";M:IF
 M<0ORM>59THEN140                                  NO
·210 NUM=M:GOSUB370:POKE56330,16*FD+SD             EG
·220 INPUT"[DOWN]WHAT IS THE SECOND";S:IF
 S<0ORS>59THEN140                                  BE
```

```
·230 NUM=S:GOSUB370:POKE56329,16*FD+SD       AE
·240 PRINT"[DOWN][DOWN]CONTINUOUS TIME DI
 SPLAY? ([RVSON]Y[RVSOFF]/[RVSON]N[RVSOFF
 ])"                                         PB
·250 GETA$:IFA$=""THEN250                    HK
·260 IFA$="N"THENPOKE40739,0                 PM
·270 PM=0:INPUT"[CLEAR]WHAT IS THE ALARM
 HOUR";AH:IFAH<0ORAH>23THEN270               HB
·280 IFAH>12THENAH=AH-12:PM=-1               DC
·290 IFPM=0THENGOSUB420                      NO
·300 NUM=AH:GOSUB370:POKE40737,-128*PM+16
 *FD+SD                                      ME
·310 INPUT "[DOWN]WHAT IS THE ALARM MINUT
 E";AM:IFAM<0ORAM>59THEN270                  LC
·320 NUM=AM:GOSUB370:POKE40738,16*FD+SD      PH
·330 PRINT"[DOWN][DOWN]AUDIO ALARM? ([RVS
 ON]Y[RVSOFF]/[RVSON]N[RVSOFF])"             KN
·340 GETA$:IFA$=""THEN340                    HK
·350 IFA$="N"THENPOKE40680,0                 OP
·360 SYS40449:PRINT"[CLEAR]":END             PL
·370 REM ** SUBROUTINE                       CJ
·380 A$=STR$(NUM):IFLEN(A$)=3THENFD=VAL(M
 ID$(A$,2,1)):GOTO400                        NJ
·390 FD=0                                    HB
·400 SD=VAL(RIGHT$(A$,1))                    EL
·410 RETURN                                  IM
·420 REM ** SUBROUTINE                       CJ
·430 PRINT"[DOWN][RVSON]A[RVSOFF]M OR [RV
 SON]P[RVSOFF]M"                             CC
·440 GETA$:IFA$=""THEN440                    HH
·450 IFA$="P"THENPM=-1                       AK
·460 RETURN                                  IM
·40449 DATA120,173,20,3,73,40                PD
·40455 DATA141,20,3,173,21,3                 OB
·40461 DATA73,116,141,21,3,88                OG
·40467 DATA169,0,141,8,220,96                CN
·40473 DATA173,35,159,240,121,160            BH
·40479 DATA31,173,32,208,153,0               DN
·40485 DATA216,200,192,40,208,248            GL
·40491 DATA173,11,220,41,16,74               IO
·40497 DATA74,74,74,9,176,201                CB
·40503 DATA176,208,2,169,160,141             KG
·40509 DATA31,4,173,11,220,41                BC
·40515 DATA15,9,176,141,32,4                 OF
·40521 DATA173,11,220,41,128,240             PE
·40527 DATA8,169,144,141,39,4                PB
·40533 DATA76,93,158,169,129,141             HO
·40539 DATA39,4,169,186,141,33               GH
·40545 DATA4,173,10,220,41,112               HH
·40551 DATA74,74,74,74,9,176                 ME
·40557 DATA141,34,4,173,10,220               LB
·40563 DATA41,15,9,176,141,35                NM
·40569 DATA4,169,186,141,36,4                EM
·40575 DATA173,9,220,41,112,74               HE
·40581 DATA74,74,74,9,176,141                CA
·40587 DATA37,4,173,9,220,41                 NE
·40593 DATA15,9,176,141,38,4                 AL
·40599 DATA173,11,220,41,159,205             JN
·40605 DATA33,159,208,100,173,10             OL
·40611 DATA220,41,127,205,34,159             IP
·40617 DATA208,90,173,2,159,208              IO
·40623 DATA36,169,181,141,0,212              NB
·40629 DATA169,23,141,1,212,169              EK
·40635 DATA0,141,5,212,169,240               AC
·40641 DATA141,6,212,169,33,141              JE
·40647 DATA4,212,173,32,208,141              IG
·40653 DATA3,159,169,255,141,2               LG
·40659 DATA159,206,32,159,208,38             JB
·40665 DATA174,32,208,236,3,159              LJ
·40671 DATA208,14,173,4,159,141              EK
·40677 DATA32,208,169,15,141,24              HK
·40683 DATA212,76,250,158,173,3              EC
·40689 DATA159,141,32,208,169,0              KJ
·40695 DATA141,24,212,169,30,141             ON
·40701 DATA32,159,76,26,159,0                NK
·40707 DATA0,10,173,2,159,240                PP
·40713 DATA16,173,3,159,141,32               GP
·40719 DATA208,169,0,141,24,212              DM
·40725 DATA169,0,141,2,159,173               HI
·40731 DATA8,220,76,49,234,30                CM
·40737 DATA0,0,255                           OE
```

BASIC RELOCATOR
FROM PAGE 30

```
·1 SYS2063:END:REM"[61"A"]                   JE
·2 REMAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA
 AAAAAAAAAAAAAAA                             KE
·900 REM                                     JD
·910 REM SAVE THIS PROGRAM TO DISK BEFORE
  RUNNING IT                                 OB
·920 REM MAKE SURE THE REM STATEMENTS ARE
  PACKED WITH THE PROPER AMOUNT OF A'S       LC
·930 REM TO RUN, TYPE 'RUN1000'.
  NOT 'RUN'                                  NF
·940 REM                                     JD
·1000 POKE2049,133:CK=0: FORX=2063TO2182:
  READ A: CK=CK+A: POKEX,A: NEXT             GM
·1010 IF CK<>11741 THEN PRINT"ERROR IN DA
 TA STATEMENTS": STOP                        DA
·1020 DATA 172,122,160,56,173,130,8,133,4
 4,233,8,133,25,24,165,45                    OH
·1030 DATA 133,27,133,29,165,46,133,28,10
 1,25,133,30,133,46,165,27                   JO
·1040 DATA 208,4,198,28,198,30,198,27,198
 ,29,177,27,145,29,165,27                    DA
·1050 DATA 208,244,165,28,201,8,208,230,2
 30,29,177,29,200,17,29,240                  PH
·1060 DATA 21,24,177,29,101,25,145,29,133
 ,2,136,177,29,133,29,165                    PJ
·1070 DATA 2,133,30,76,73,8,174,110,160,1
 42,120,2,142,123,2,162                      JO
·1080 DATA 49,142,119,2,162,82,142,121,2,
 162,117,142,122,2,162,5                     HA
·1090 DATA 134,198,96                        JO
·1100 DATA 16: REM PAGE TO TRANSFER TO       FA
·1110 DATA 34,0,0,0                          AJ
```

INFRARAID

Continued from page 112

(Note that the last zero in line 10 is printed in white, indicating where TXTPTR is pointing.)

Try other examples such as

```
10 A=X/0
```

```
10 A=A$
```

```
10 ?:?CHR$(-1):?
```

A special case that needs to be discussed further is that of the READ-DATA statements. Try these examples and note any differences in how they are handled:

```
10 READ A
```

```
10 READ A
20 PRINT
```

```
10 READ A
20 DATA "STRING"
```

In the first example, READ is being pointed at by TXTPTR; therefore it is displayed in white. In the second example, however, READ is not displayed in white because TXTPTR does not point to it. What happens is that BASIC searches the entire text for DATA statements and if one is not found, TXTPTR is pointing to the end of the program, but CURLIN, the current BASIC text line number, is still pointing to the line where the READ originated. When *Infraraid* prints the current line it compares the address of the character it is printing to TXTPTR; when, and only then, will that character be printed in white. In the example it never matched the addresses, so no character in that line was highlighted. This is always the case unless the READ statement is on the last text line in a program and there are no DATA statements.

In the third example above the DATA line is displayed, since the error occurred in that line rather than the READ line. The DATA item searched for is numeric, and since the first character in the DATA line is non-numeric, an error was generated. Note that BASIC displayed a ?SYNTAX ERROR even though technically it should have been a ?TYPE MISMATCH ERROR. Also note that this could be quite handy debugging programs with large amounts of data where there is both numeric and non- numeric data, since *Infraraid* shows you exactly which data caused the error.

This feature of pinpointing errors alone can be quite helpful in debugging programs, but *Infraraid* can also trap some errors within the program. The problem I had with my calculator simulation program was not a program bug but a system limitation. I had to keep the program from crashing when handling larger numbers than BASIC would normally allow. *Infraraid* lets you do that using the trap variable TR% (refer to Table 2). Try this example:

```
10 TR%=1
20 PRINT 10↑100
```

Notice that the number 332.192809 was printed rather than an error message. What *Infraraid* did was check the variable TR% when the error was generated in line 20. Since the first bit in TR% was set, *Infraraid* passed control back to the BASIC routine instead of recognizing the error. The BASIC routine then executed as if no overflow error occurred and it printed the number it had previously calculated. Note that the displayed number is garbage and must be treated as such. When trapping errors in this manner, always check ER% to determine whether an error occurred or not. When a program is run, ER% is set to 0; however, when ER% is set by an error, the program must reset it to 0. In the above example, for instance, you could add:

```
30 IF ER%=15 THEN ER%=0:GOTO (wherever
you want)
```

In addition to trapping certain errors, *Infraraid* also lets the program jump to its own error handling routine when it encounters a trapped error. The programmer simply specifies the line number to jump to in EL% (see Table 3). When *Infraraid* encounters an error trapped by TR% it will perform a GOTO of the line number specified in EL%, if EL% is not equal to 0. This example will demonstrate how it works:

```
10 EL%=1000:REM ERROR ROUTINE STARTS AT
1000
20 TR%=15:REM TRAP ALL POSSIBLE ERRORS
30 PRINT 10 100:REM TRY DIFFERENT ERROR
S IN THIS LINE
40 END
1000 REM ERROR ROUTINE
1010 IF ER%=4 THEN PRINT "FILE NOT FOUN
D"
1020 IF ER%=5 THEN PRINT "DEVICE NOT PR
ESENT"
1030 IF ER%=15 THEN PRINT "OVERFLOW"
1040 IF ER%=20 THEN PRINT "DIVISION BY
ZERO"
1050 ER%=0:REM MUST RESET ER%
1060 GOTO 40
```

As a final note, the RUN/STOP-RESTORE sequence will not disable *Infraraid*. If you wish to do this without reseting the computer use:

```
POKE 768,PEEK(50657):POKE 769,PEEK(5065
8)
```

Infraraid was written with the *Commodore 64 Macro Assembler Development System.* □

SEE PROGRAM LISTING ON PAGE 132

TABLE 3
Variable pointer to the line bumber of your BASIC error routine

Range of values for EL%	Range of line numbers pointed to
0	none (deactivated)
1 to 32767	1 to 32767
−32768 to −1537	32768 to 63999
−1536 to −1	64000 to 65535 (illegal)

STREAMER FONT

Continued from page 29

tinue. If you enter a null string the SAVE command is aborted, and you're taken back to the main program. Press SHIFT-L to LOAD your font back into memory.

Although you can't SAVE a character file on tape, you can tack your font on to the end of the program and SAVE it along with your program. If you have a program that accelerates tape LOADs and SAVEs, this method could be an advantage. There is, however, one drawback with amalgamating your program and file. The font memory, which begins at 8192, is 2K above the program. It can't be lowered to follow immediately after the program, as the rotated display would be usurped by your computer's character information. This is because *Streamer Font*'s characters are stored in memory in a manner similar to sprites, and sprites located below 8192 will not be displayed. The upshot of all this is that you must save nearly 2K of useless memory along with your program and file. Even with this excess baggage, your program/file will still only be 8½K long, a reasonable length thanks to the brevity of machine language.

Here's how to wed your program to your font file. First LOAD *Sequela* using *Flankspeed*. Then type in NEW. Now LOAD *Streamer Font* and enter the following POKES:

```
POKE5802,1:POKE45,0:POKE46,42
```

The first POKE will set the switch so that the font memory is not cleared. The other two will move the BASIC end-of-program pointer to the end of the file. If you don't wish to add *Sequela*, just go through the same steps except loading the file into memory. Now SAVE *Streamer Font* as you normally would. Whenever you design a character set with this new program, it will automatically be SAVEd with it.

Finally we get to what *Streamer Font* is all about: printing banners! There are two print defaults. One is the size. If the size is not set, the program automatically prints the smallest size, 2.4 inches high. This can be altered by pressing SHIFT 1-5, where 1 is the smallest size. Press SHIFT-5 and your characters will be printed 7.2 inches high.

The other default is the composition of your characters. If this is not reset your letters will be printed with the numerical symbol, #, on a background of spaces. To change this, press f6. You will then be asked for the foreground character. Enter the character or graphic symbol of your choice. After that, you'll be asked if you wish this character to be printed in reverse. Answer Y or N. Now you'll be queried for a background character. Type this in and you'll be taken back to the main program.

To send your characters to the printer, press f5 and you'll be prompted to enter your message. Like the SAVE and LOAD filenames, you can only edit your input with the DEL key, and you can abort by entering a null string. Up to 33 characters can be entered at one time, although you can easily string several of these together for very long messages. *Streamer Font* will automatically account for SPACEs in your messages providing that the background character is a space. Since some printers take the time to print spaces, this will make for faster printing. If, on the other hand, you are using a background character other than CHR$(32), you must use an empty character from your font. The left margin, incidentally, is adjusted so that your message appears centered. Once your message is entered, printing begins. When it comes to line spacing, no spaces will be printed between the lines on Commodore printers. If it's necessary to stop printing, you can do so by holding down the RUN/STOP key.

SEQUELA

By the time you've finished typing in 4K of machine language, you may balk at entering another 2.5K. Even so, *Streamer Font* would be incomplete if I didn't include a character set. You'll like *Sequela* as it's an attractive font that can be used for nearly any message. And once you've entered and SAVEd it, you can easily alter it to suit your whims. To enter *Sequela* you must again use *Flankspeed*, but unlike *Streamer Font*, there's no need to change any pointers since it will sit well above *Flankspeed*. LOAD and RUN *Flankspeed* and enter in the hexadecimal addresses.

Like cassette users, disk users will have to follow a few steps to get *Sequela* into the font memory. First use *Flankspeed* to LOAD *Sequela* into memory. Type in NEW and LOAD *Streamer Font*. Now POKE5802,1. Enter RUN and you should see a large A and B on the screen. Press SHIFT-S to SAVE *Sequela* to disk. □

SEE PROGRAM LISTING ON PAGE 124

Why settle for less when you can have Mo?



Mitey Mo turns your Commodore 64 into a telecommunications giant. It's the best-performing modem with upload/download.

Mitey Mo is being hailed as "the best price/performance communications package available." Its software has received the endorsement of the U.S. Commodore Users Group, which gives a money-back guarantee to members. It is truly the industry standard, and no wonder. It's the most user-friendly modem you can buy—it will take you online faster and easier than anything else.

Mitey Mo opens up a world of practical and exciting uses for your C-64. It lets you send and receive electronic mail, link up with community bulletin boards, play computer games with people in distant places, tap into library resources, and much more. All at your convenience.

Until Mitey Mo, Commodore's 1650 Automodem was the obvious choice when you went looking for a modem for your computer. Like Mitey Mo, it has "auto answer"—it receives data while unattended. And both modems are "auto dialers"—you dial right on the computer's keyboard. But that's about where the similarity ends.

Mitey Mo can dial up to 9 numbers sequentially. But suppose you dial a number and find it's busy. Mitey Mo has "auto redial"—it hangs up and redials immediately until it gets through. With the other modem you have to redial each time—and somebody with auto redialing can slip in ahead of you.



Mitey Mo is menu driven. It lists the things you can do on the screen. Select a number and you're on your way. Since Automodem isn't menu driven, you'll be hunting through the manual a lot.

With Mitey Mo, your computer's function keys are programmable—you can save yourself plenty of keystrokes. Not so with the other modem. And only Mitey Mo lets you store data to review or print it later.

MODEM FEATURES	MITEY MO	COMMODORE AUTOMODEM
Auto Dial/Answer	YES	YES
Auto Redial	YES	NO
Smart 64 Software	YES	NO
Function Keys Programmable	YES	NO
Upload/Download Text & X-Modem	YES	NO
VT-52/VT-100 Emulation	YES	NO
Menu Driven	YES	NO
28K Software Buffer	YES	NO
Easy-to-Use Manual	YES	NO
Bell 103 Compatible	YES	YES
Multiple Baud Rates	YES	YES
Cable Included	YES	YES
Single Switch Operation	YES	NO
Warranty	3 years	90 days

Some mighty interesting features—ours and theirs. Yours to decide.

Mitey Mo has just one switch, the Smart 64 software does the rest. With the other modem you'll have to remember to check three switches, otherwise you may be answering when you mean to be originating.

Mitey Mo is half the size of the other modem. The very latest technology allows miniaturization and increased reliability, as well. Mitey Mo is so reliable, we gave it a full three-year warranty. The other modem gives 90 days, then you're on your own.

Not only will you find Mitey Mo mighty useful, you'll find it mighty reasonably priced. When you buy it, you'll get $15 of CompuServe access time and 2 hours of PlayNet free, as well. See your dealer or call us directly to order your Mitey Mo.

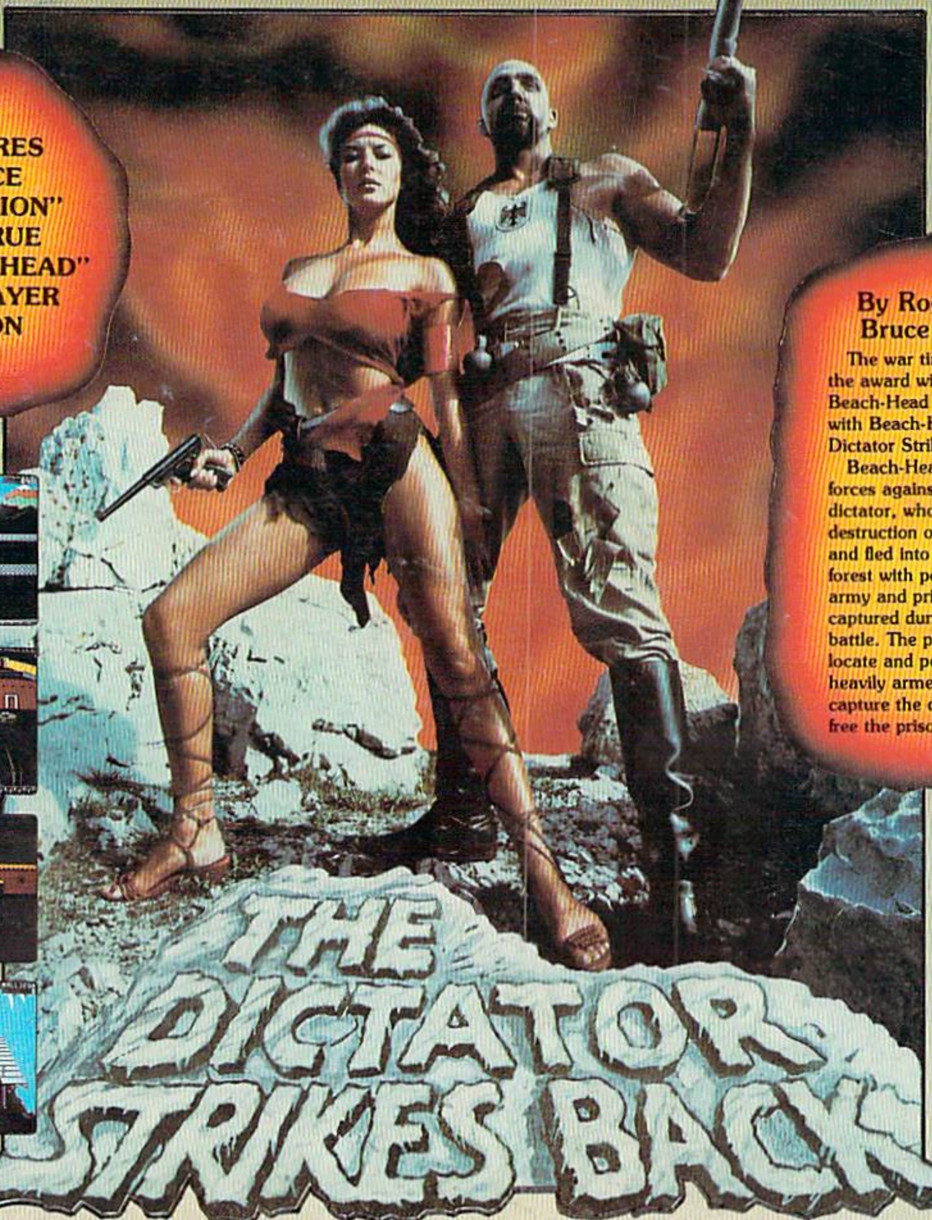


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